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REPORT

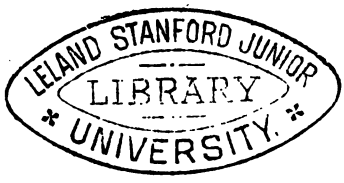
OF THE

INTERNATIONAL AMERICAN CONFERENCE

RELATIVE TO

AN INTERCONTINENTAL RAILWAY LINE.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1890.



H. 3924.

MESSAGE

FROM THE

PRESIDENT OF THE UNITED STATES,

TRANSMITTING

A letter of the Secretary of State and report of the International American Conference relative to an international railway line.

MAY 19, 1890.—Read, referred to the Committee on Foreign Relations, and ordered to be printed.

To the Senate and House of Representatives:

I transmit herewith a report of the International American Conference, recently in session at this Capital, recommending a survey of a route for an intercontinental line of railroad to connect the systems of North America with those of the Southern Continent, and to be conducted under the direction of a board of commissioners representing the several American Republics.

Public attention has chiefly been attracted to the subject of improved water communication between the ports of the United States and those of Central and South America. The creation of new and improved steam-ship lines undoubtedly furnishes the readiest means of developing an increased trade with the Latin-American nations. But it should not be forgotten that it is possible to travel by land from Washington to the southernmost capital of South America, and that the opening of railroad communication with these friendly States will give to them and to us facilities for intercourse and the exchanges of trade that are of special value. The work contemplated is vast, but entirely practicable. It will be interesting to all and perhaps surprising to most of us to notice how much has already been done in the way of railroad construction in Mexico and South America that can be utilized as part of an intercontinental line. I do not hesitate to recommend that Congress make the very moderate appropriation for surveys suggested by the Conference, and authorize the appointment of commissioners and the detail of engineer officers to direct and conduct the necessary preliminary surveys.

BENJ. HARRISON.

EXECUTIVE MANSION, 3
May 19, 1890.

PROPOSED INTERCONTINENTAL RAILWAY.

Letter from the Secretary of State.

DEPARTMENT OF STATE,
Washington, May 12, 1890.

To the PRESIDENT:

I have the honor to submit herewith a plan for a preliminary survey for a railway line to connect the great commercial cities of the American hemisphere. No more important recommendation has come from the International American Conference, and I earnestly commend it to your attention, with full confidence that prompt action will be taken by Congress to enable this Government to participate in the promotion of the enterprise. The resolutions of the Conference are accompanied by special reports concerning the transportation facilities that already exist in the several American Republics. These reports comprise all the information that could be gathered upon this important subject, and will be found both interesting and authentic.

Under the generous and progressive policy of President Diaz the railways of Mexico have been extended southward as well as northward and toward the two oceans. The development of the Argentine system has been equally rapid. Lines of track now reach from Buenos Ayres to the northern cities of that Republic, and nearly to the Bolivian boundary. Chili has a profitable system of railroads from the mountains to the Pacific Ocean, and the completion of the tunnel that is now being pierced through the Cordilleras will bring Valparaiso within two days' travel of Buenos Ayres. In the other Republics similar enterprise has been shown. Each has its local lines of railway, and to connect them all and furnish the people of the Southern Continent the means of convenient and comfortable intercourse with their neighbors north of the Isthmus is an undertaking worthy the encouragement and co-operation of this Government. In no other way could the Government and the people of the United States contribute so much to the development and prosperity of our sister Republics and at the same time to the expansion of our commerce.

A very important feature of the report, to which I especially direct your attention, will be found in the international declaration that the line of the proposed railway shall be forever neutral territory; that the material necessary for the construction and operation of the road shall be admitted free of customs dues, and that its property and revenues shall be always exempt from all forms of taxation. This guaranty, having all the force of a treaty, will stimulate private and public confidence, and thus lead to the investment of capital that might otherwise be reluctant and distrustful.

It is proposed that a survey to ascertain the best and most economical routes be made under the direction of an international commission, and that the expense be shared by the several nations of the hemi-

sphere in proportion to their respective populations. The share of the United States is estimated to be $65,000, and I would respectfully suggest the propriety of securing from Congress an appropriation for that purpose. Three commissioners will be required to represent the United States upon the international board, and authority should be asked for the detail of officers of the Army and Navy to serve as engineers in conducting the survey.

The headquarters of the commission, by a vote of the International Conference, will be located in Washington, and it is proposed to invite the commissioners to meet here on the 1st of October next, or as soon thereafter as may be practicable, for the purpose of organization and initiating the work of the survey.

Respectfully submitted,

JAMES G. BLAINE.

REPORT

OF THE

COMMITTEE ON RAILWAY COMMUNICATION.

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Report to the Hon. H. G. Davis and Andrew Carnegie, United States Delegates, upon the railways of Spanish America, by Lieut. George A. Zinn, Corps of Engineers, U. S. Army 83

LIST OF MAPS.

Western Hemisphere.
United States, Mexico, and Central America.
Mexico.
Central America.
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INTERNATIONAL AMERICAN CONFERENCE.

REPORT OF THE COMMITTEE ON RAILWAY COMMUNICATION.

The International American Conference is of the opinion:

First. That a railroad connecting all or a majority of the nations represented in this Conference will contribute greatly to the development of cordial relations between said nations and the growth of their material interests.

Second. That the best method of facilitating its execution is the appointment of an international commission of engineers to ascertain the possible routes, to determine their true length, to estimate the cost of each, and to compare their respective advantages.

Third. That the said commission should consist of a body of engineers of whom each nation should appoint three, and which should have authority to divide into subcommissions and appoint as many other engineers and employés as may be considered necessary for the more rapid execution of the work.

Fourth. That each of the Governments accepting may appoint, at its own expense, commissioners or engineers to serve as auxiliaries to the subcommissions charged with the sectional surveys of the line.

Fifth. That the railroad, in so far as the common interests will permit, should connect the principal cities lying in the vicinity of its route.

Sixth. That if the general direction of the line can not be altered without great inconvenience, for the purpose mentioned in the preceding article, branch lines should be surveyed to connect those cities with the main line.

Seventh. That for the purpose of reducing the cost of the enterprise the existing railways should be utilized as far as is practicable and compatible with the route and conditions of the continental railroad.

Eighth. That in case the results of the survey demonstrate the practicability and advisability of the railroad, proposals for the construction either of the whole line or of sections thereof should be solicited.

Ninth. That the construction, management, and operation of the line should be at the expense of the concessionaires, or of the persons to whom they sublet the work or transfer their rights, with all due formalities, the consent of the respective Governments being first obtained.

Tenth. That all materials necessary for the construction and operation of the railroad should be exempt from import duties, subject to such regulations as may be necessary to prevent the abuse of this privilege.

Eleventh. That all personal and real property of the railroad employed in its construction and operation should be exempt from all taxation, either national, provincial (State), or municipal.

Twelfth. That the execution of a work of such magnitude deserves to be further encouraged by subsidies, grants of land, or guaranties of a minimum of interest.

Thirteenth. That the salaries of the commission, as well as the expense incident to the preliminary and final surveys, should be assumed by all the nations accepting, in proportion to population according to the latest official census, or, in the absence of a census, by agreement between their several Governments.

Fourteenth. That the railroad should be declared forever neutral for the purpose of securing freedom of traffic.

Fifteenth. That the approval of the surveys, the terms of the proposals, the protection of the concessionaires, the inspection of the work, the legislation affecting it, the neutrality of the road, and the free passage of merchandise in transit, should be (in the event contemplated by article eighth) the subject of special agreement between all the nations interested.

Sixteenth. That as soon as the Government of the United States shall receive notice of the acceptance of these recommendations by the other Governments, it shall invite them to appoint the commission of engineers referred to in the second article, in order that it may meet in the city of Washinton, at the earliest possible date.

JUAN FRANCISCO VELARDE.
H. G. DAVIS.
E. A. MEXIA.
FERNANDO CRUZ.
JERÓNIMO ZELAYA.
JACINTO CASTELLANOS.
ANDREW CARNEGIE.
CARLOS MARTINEZ SILVA.
JOSÉ ANDRADE.
J. M. P. CAAMAÑO.
F. C. C. ZEGARRA.
E. C. VARAS.
MANUEL QUINTANA.
J. G. DO AMARAL VALENTE.
JOSÉ S. DECOUD.
H. GUZMAN.

LETTER FROM THE CHAIRMAN OF THE COMMITTEE.

INTERNATIONAL AMERICAN CONFERENCE,
Washington, April 18, 1890.

To the honorable President of the International American Conference:

Mr. PRESIDENT: As an addition to the report made by the Committee on Railroads, I have the honor to transmit herewith to the table, for insertion as an appendix, the personal reports of the Delegations from Peru, Guatemala, Colombia, Costa Rica, Uruguay, Paraguay, Brazil, Honduras, Mexico, Bolivia, United States of America, Venezuela, Salvador, and Ecuador.

The Delegations from Argentine and Nicaragua have offered to send in reports of their respective countries. Although deficient in some statistical data, the accompanying reports give a general idea of the present service of the railroads, the length of the lines in operation, those in course of construction and survey; thus enabling one to appreciate the importance of the work realized up to date, and that what is needed to place in practical effect the beautiful idea of a continental railroad that will bind all the nations represented in the Conference.

I entertain the conviction that the day is not far distant when the great work of a continental railroad will become a fact, and that the recommendation made by the Conference will have contributed powerfully towards its realization.

I have no doubt that the measures for its survey and execution proposed by the Conference will receive the unanimous approval of all the Governments of America.

Saluting the President with such gratifying motives, and reiterating to him the assurance of my most high and distinguished consideration, I am

Your obedient servant,

JUAN FRANCISCO VELARDE.

RAILWAYS OF THE ARGENTINE REPUBLIC.

The first line built was probably that from Rosario to Córdoba, commenced in 1863 and finished in 1870. In 1873 the Government finished the first section of the Transandine Railway, 82 miles, from Villa Mercedes to Rio Cuarto. In 1875 the second section, from Rio Cuarto, 76 miles, was in operation. In 1880 were completed 59 miles, to the city of San Luis. In 1883, 75 more were finished, and La Paz became the terminus for the time being. In April, 1885, 80 miles were opened from La Paz to Mendoza; a branch of 100 miles from Mendoza to San Juan was opened at the same time. The total cost to the Government thus far, of the 472 miles, had been $13,000,000. From Mendoza to the Chilian boundary, through the Uspallata Valley, is 140 miles. The road runs at nearly double the elevation of the Central Pacific line across the Rocky Mountains. The Northern Central Argentine at Córdoba, connecting with the Central and extending northward to Salta, is a narrow-gauge road of 340 miles, and was continued through the province of Jujuy.

In 1885 three railways were opened for traffic—the Mercedes, Andine East Argentine, and Campana lines. The Tucuman line was to be completed in 1876, when there would be in all ten railroads with a total of 2,260 kilometers, or 1,404 miles, in operation. The Andine line was leased to a private person for four years with the condition that he should receive 80 per cent. of the gross receipts for the first three years and 75 per cent. for the last year. The Central Argentine, which opened in 1870, earned in 1875 a surplus of $161,000 in addition to the guarantied interest of 7 per cent on the capital stock. That surplus was paid over to the Government.

In 1886 there were in operation 6,152 kilometers, of which 1,877 were national, 1,104 provincial, and 3,160 private property. There were consequently added to the 2,318 kilometers existing in 1880, during the last five years, 3,834 kilometers. The total cost of the lines existing in 1885 was about $1,000,000,000, or an average of about $33,330 per mile.

The gross earnings of all the railroads in 1885 were $416,150,894; the net earnings were $6,489,701; the percentage of net earnings were 7.32 against 5 in the United States, and 4½ in England, and 4½ in Germany and France.

E. L. Baker, esq., United States consul at Buenos Ayres, in a report of December 17, 1886, says:

As showing the progress which railway construction has been making in the Argentine Republic, I may say that in October, 1880, the total number of kilometers was

2,318, of which 810 belonged to the national Government, 348 to the provincial government of Buenos Ayres, and 1,104 were in private hands. There are now 6,152 kilometers in the Republic, of which 1,877 belong to the nation, 1,104 to the provincial governments, and 3,161 to private companies; a gain of about 3,834 kilometers in a little over five years.

Mr. Vilas, secretary of legation at Buenos Ayres, in a report to Department of State, dated July 22, 1889, says:

I forward herewith certain figures taken from the report upon the railways of the Argentine Republic for the year 1888, prepared by Mr. Cortinez, under the direction of the national railway board recently created. * * *

Amount of railway capital in country in 1888, $220,746,247; gross earnings, $26,526,707; working expenses, $15,529,993; net earnings, $11,500,000.

Net earnings of Argentine railways for 1888.

Railways.	Capital.	Returns.	Expenses.	Net.
Buenos Ayres and Rosario	$33, 330, 000	$3, 312, 882	$1, 577, 280	$1, 735, 603
Primer Entre Riano	153, 839	153, 839	10, 453	552
Central Argentine	18, 648, 000	3, 815, 325	1, 798, 113	2, 017, 212
East Argentine	4, 989, 615	271, 185	269, 882	1, 303
Argentine Great Western	16, 984, 800	897, 791	1, 366, 774	.....
Central Northern	26, 990, 342	2, 367, 941	1, 594, 638	773, 303
Province of Buenos Ayres	27, 474, 283	4, 867, 550	2, 873, 622	1, 993, 928
Andine	4, 366, 565	441, 024	284, 182	156, 842
Central Entre Riano	6, 000, 000	261, 394	278, 235	.....
Buenos Ayres Northern	2, 991, 487	735, 325	365, 854	369, 471
Ensenada	6, 681, 885	1, 152, 791	552, 843	599, 948
Great Southern	40, 320, 000	6, 172, 033	2, 782, 847	3, 389, 186
Oeste Santa Fecino	3, 000, 000	277, 015	336, 903	.....
Santa Fé Colonies	9, 839, 088	801, 946	615, 256	186, 690
Northwestern Argentine	4, 273, 920	12, 267	12, 267	.....

The following loans were made: Argentine Great Western, $468,983.51; Central Entre Riano, $16,841.43; Oeste Santa Fecino, $59,888.65; total loans, $545,713.58.

The rate of returns upon capital is as follows:

Lines.	Rates of returns.	Lines.	Rates of returns.
	Per cent.		*Per cent.*
Buenos Ayres and Rosario	7.04	Pacific Railway	2.16
Primer Entre Riano	0.35	Andine	3.05
Central Argentine	10.82	Northern Railway	12.35
East Argentine	0.26	Ensenada	8.96
Central Northern	2.86	Great Southern	8.41
Province of Buenos Ayres	7.86	Santa Fé Colonies	1.90

The number of passengers carried in 1888 was 9,681,233; tonnage of goods, 3,937,534.

United States Consul Edward L. Baker, under date of December 13, 1889, furnishes the following on railways in the Argentine Republic:

There continues to be a great movement throughout the Argentine Republic in the construction of railways. So great are the number of new concessions granted by the national Congress and by the different provincial legislatures that I find it impossible to name them all. Up to the meeting of the last Congress there were national concessions for seventeen different lines, of which thirteen enjoy the guaranty of the Government. These guarantied lines represent a total length of 7,961 kilometers (4,975 miles), and the aggregate length of the other lines 1,272 kilometers (795 miles), making a total of 5,770 miles. Among them are the following, viz: The Chaco and Tartagal Railway, the Reconquista and Formosa (Chaco) Railway, the Bahia Blanca and Villa Mercedes Railway, the San Juan and Salta Railway, the Chum-

bicha, Tinogasta and Andalgala Railway, the Goya and Monte Caseros Railway, the Resistencia and Metan Railway, the San Cristobal and Tucuman Railway, etc. A line from San Juan to Cabra Corral, in Salta, is being surveyed, as also one from Mendoza to San Rafael; also the line from Cobos to Salta via Lagunilla, and several others of less prominence.

The following roads are in the course of construction, to wit, the extensions of the Northern Central, the road now being opened beyond Tucuman as far as Chilcas. The branches from Dean Furnes to Chilicito, and from Chumbicha to Catamarca have the road-beds completed, and the track-laying has commenced. Beyond Chilcas towards Salta and Jujuy the work is still progressing, but there are many engineering difficulties to overcome, and not much has yet been accomplished. The line from Buenos Ayres to Mercedes, which is a link of the Transardine Railway, is now completed and opened to traffic, thus giving a through line from Buenos Ayres as far as Mendoza. Work continues to progress on the line from Mendoza towards Valparaiso, Chili, some of the track having already been laid, and by the end of the year it is expected that the Uspallata Pass of the Andes will be reached. For the construction of the railway from Monte Caseros to Corrientes and Posadas in the Misiones the necessary materials are now being received, and the work has commenced. The new line from Rosario via Sunchales to Tucuman is being rapidly pushed forward, and the rails are laid for 50 or 60 miles beyond Sunchales.

The last session of the Argentine Congress, in response to the recommendations of the President, made a very firm stand against the granting of any more charters or concessions with Government guaranties, and the fact that numerous applications were made for new lines without such guaranties shows that the condition of the country is now so promising that capital is ready to embark in such enterprises without Government aid (December 18, 1889).

Consul Baker's last report (December 22, 1889) says:

Railways, however, are rapidly extending themselves in nearly every part of the Argentine Republic. There was never before known such a push to obtain concessions or charters for new lines as has been the case during the last year, the National Government indiscriminately with the provincial governments being appealed to by the applicants. A year ago the Government expressed its determination to grant no more concessions which carried with them a guaranty on the part of the nation that if the enterprise did not pay a certain per cent. the Government would make good the difference; but, during the recent session of Congress, several new lines were chartered with this provision.

The total length of all the railways in the Argentine Republic now amounts to 7,700 kilometers, an increase since the previous year of 958 kilometers. There are now in process of construction as follows:

Description.	Length.	Description.	Length.
	Kilometers.		*Kilometers.*
By the Government:		By the provincial governments—continued.	
From Chambicha to Catamarca	65	From La Plata to Rio Santiago	8
From Dean Funés to Chilicito	415	From Gualeguay to Tala	109
From Chilcas to Jujuy	124	From Nogoya to Victoria	50
From Santa Rosa to Salta	64	Madrid to Tucuman	105
By private parties with Government guaranty:		From Santa Fé provincial roads	444
Section of Northeast Argentine	809	By private companies, without guaranty:	
Section of Transaanine	192	Cordoba to Santa Fé	282
Nanducito to Tucuman	1,070	Cañada de Gomez and Las Yerbas	127
By the provincial governments:		Cañada de Gomez and Pergamino	141
From Nueve de Julio to Trenque-Lauquen	183	Sunchales and Tucuman	610
From Riachuelo to the maritime station	7	Total	4,798

During the year the railways of the country transported 8,373,500 passengers and 3,950,000 tons of cargo, against 7,173,500 passengers and 3,866,523 tons of cargo the previous year. The railways in operation have 602 locomotives, 912 coaches for passengers, and 14,324 cargo wagons, and they represent a capital of $193,000,000.

During the year 1888 the National Government paid out of its treasury for guaranties to railways the sum of $3,000,000 in gold. The President, however, in view of the fact that some of the guarantied railway companies persistently neglect to keep their roads in proper condition and are without the necessary equipment to transact the business for which they were chartered, has just issued an order suspending the payment of any further guaranties until they conform to the law in these respects.

It is not deemed necessary here to give a list of the various railways which have recently been chartered, but which have not yet been "floated," or whose surveys have not yet been completed. Owing to the present financial condition of the country, the construction of some of these will probably be postponed for the present. For the same reason the National Congress, at its recent session, failed to act upon another large "batch" of projected railways, but left them for future consideration

RAILWAYS OF BOLIVIA.

*REPORT OF JUAN F. VELARDE, DELEGATE FROM BOLIVIA.**

MEMORANDUM ON RAILROADS IN BOLIVIA.

The Republic of Bolivia, with a population of 2,500,000, has an area of 55,000 square leagues, or 275,000 square kilometers.

Situated in the center of the South American continent, it is bounded on the north and east by Brazil, on the southeast by the river Paraguay and the Republic of that name, on the south by the Argentine Republic, on the southwest by Chili; on the west by the Pacific Ocean and Peru.

The eastern part is level, as if it were a continuation of the Argentine pampas, which extend as far as the plains of Venezuela, forming forests, prairies, and fields of extraordinary tropical fertility.

The western part is mountainous, having a mild or cold climate, according to the height of the valleys, broken country, or table-lands, where the principal settlements of the Republic are located.

The Andes range, which forms this region, divides in latitude 22° south, and enters the Bolivian territory in two sections, the western or coast range and the eastern or principal range, from which latter separate several branches, running inland until they are lost in the plains of the east.

Between these two ranges is found the high Inter-Andine table-land, with an average altitude of 12,000 to 13,000 feet above the level of the sea, at the northern end of which is situated the great lake Titicaca, and toward the southern or central region Lake Poopó, which receives the waters of the former by means of the river Desaguadero. The extent from north to south of this table-land is about 150 or 200 leagues, with a width from east to west of from 20 to 50 leagues. It is connected on the north with the plateaus of Puno in Peru, and on the south with those of the Argentine Republic. In these regions are found the richest mines of silver, copper, tin, gold, and other minerals.

The central location of Bolivia has retarded the development of its railroads, since it has been obliged to wait until the lines of the neighboring countries should approach its own frontiers before undertaking their extension, as in the case of those from Mollendo to Puno and from Arica to Tacna, in Peru, which still remain idle within their respective limits, and that of the Central North Argentine Railway, which is now nearing Jujui, with every probability that it will be extended as far as the Bolivian frontier.

Topographical and financial difficulties for a long time prevented the

* Translation.

construction of the railway from Antofagasta to the interior, but they have lately been overcome by the Huanchaca Company, of Bolivia, which has succeeded in completing the narrow-gauge railroad between Antofagasta and Uyuni, with an extent of 600 kilometers. The same company has contracted for the extension of this line to Oruro, which is considered a distance of 320 kilometers. The Government guarantees 6 per cent. interest on the capital invested, which is estimated at £500,000 sterling.

The configuration of the territory of Bolivia, and its vast area, give origin to three channels of communication; by way of the Pacific, the river La Plata, and the Amazon, respectively, each one of which is the outlet for a particular region possessing resources of its own of great value, which will rapidly develop as soon as transportation is made cheap and easy by the construction of railroads.

The communications by the Pacific are obtained: (1) by Antofagasta Railway; (2) by the Arica Railway; (3) by the Mollendo Railway.

(1) The Antofagasta Railway, which had to contend against the obstacle presented by an uninhabitable desert, has become practicable on account of the narrow-gauge railway (75 centimeters), which runs from that place to Uyuni, as has been stated. Uyuni is at a distance of 25 kilometers from the rich mines of Huanchaca, 200 kilometers from the city of Potosi, 300 kilometers from the capital, Sucre, and 320 kilometers from Oruro.

The line crosses a very rich mineral region of much promise. Its prolongation to Oruro, with a branch line to Potosi, will tend to further develop the mineral production, which to-day is quite considerable.

(2) The Arica Railway runs a line as far as Tacna (47 miles), whence it is intended to build another to Corocoro and La Paz (about 400 kilometers). This work requires an immense capital, since the road has to ascend the coast range at its steepest part. Traffic is at present carried on by means of mules. This line is connected with the departments of La Paz, Oruro, and Cochabamba, to whose commerce it gives great facilities on account of being the shortest road.

(3) The Mollendo Railway, open to traffic since 1870, has the use of a line which leaves that port, runs through Arequipa, and ends in Puno, covering a distance of 522.96 kilometers, or 320 miles.

Bolivian traffic makes use of this railroad in connection with navigation by steamer on Lake Titicaca and the high-road from Chililaya to La Paz, 14 leagues.

The Peruvian bond-holders, to whom that railroad has been granted, have obtained concessions from Peru as well as Bolivia to extend it as far as La Paz, whence within a short time a road will be run to Oruro, 250 kilometers, in order to form a junction there with the Antofagasta road. It is intended to run a branch line from Oruro to the fertile department of Cochabamba, a distance of 200 kilometers.

The Bolivian part of the railroad from Puno to La Paz extends 150

kilometers from the Desaguadero. The nation guarantees 6 per cent. on the capital invested.

The communications with the river La Plata are carried on by means of the Northern Central Argentine Railroad and by the river Paraguay and the high-road to Santa Cruz.

The extension of the Northern Central Argentine Railroad has already reached Salta and will soon go as far as Jujui, from which place it will be extended to the Bolivian frontier, the Argentine Government having granted a concession for this. It will then be an easy matter to join this line with the Andine of Bolivia by extending it either to Uyuni or to Potosi, in either case a distance of not more than 500 kilometers.

It is proposed to run two railways from the river Paraguay, one from the Gaiva to Santa Cruz de la Sierra, running through the province of Chiquitos, over some 750 kilometers of level country, and another from Bahia Negra to Sucre, with a branch to Santa Cruz, 750 kilometers in level country and 500 in mountainous and broken country.

With these two railroads and another contemplated between Paraná and Tarija, communications will be opened with the river La Plata.

The extensive eastern region of Bolivia, rich in all kinds of tropical products of superior quality, such as coffee, cocoa, sugar, cotton, rice, tobacco, etc., and likewise in gold ore, offers a wide field for industry, commerce, and immigration.

The northern region, which is of wonderful fertility and is irrigated by the rivers Guaporé Henes, Mamoré, Beni, and Madre de Dios and their numerous navigable branches, which all unite to form the river Madera, the principal tributary of the Amazon, in order to enjoy the full benefits of steam navigation and the products of civilization, requires the construction of a railroad from the Madera to Mamoré so as to avoid the rapids which interfere with navigation on these great rivers; said railway will be, at most, 180 miles long. The survey of this road has been in the hands of a commission of engineers appointed by the Brazilian Government, and its cost has been estimated at not more than $6,000,000 in gold.

In connection with this railroad, and in order to make communications between the navigable rivers and the cities of the interior of Bolivia, it will be necessary to construct the following supplementary lines:

I. From Rio Grande, a tributary of the Mamoré, to Santa Cruz de la Sierra, 150 kilometers, through level country.

II. From the river Chimoré or Upper Mamoré to Cochabamba, 250 kilometers, through broken and mountainous country.

III. From the river Beni to La Paz, about 500 kilometers, through broken and mountainous country.

Workmen, provisions, and timber for the construction of these railroads are found in abundance in the respective departments of Santa Cruz, Cochabamba, and La Paz, which will derive great benefit from them.

It is estimated that the freight on the materials for these railways, to-

gether with that on the steamers and machinery which will have to be imported for the rivers of Bolivia, outside of the regular commercial traffic, will suffice to give life and impetus for the first few years to the Madera and Mamoré Railroad, whose importance may be compared, without exaggeration, to that of the railroad of the Isthmus of Panama.

SUMMARY.

There is in operation the narrow-gauge railway from Antofagasta to Uyuni, 610 kilometers, whose dividends exceed the guarantee of 7 per cent. interest.

There is under survey and construction the railway from Uyuni to Oruro, 320 kilometers, with a guarantee of 6 per cent. interest, and a term of two years for its completion.

There is under survey a railway to be constructed as soon as the Peruvian section is completed from Puno to the Desaguadero, running from the latter point to La Paz, 150 kilometers, with a guarantee of 6 per cent. interest.

There are in contemplation:

	Kilometers.
The railway from La Paz to Oruro	250
The railway from Oruro to Cochabamba	200
The railway from Uyuni to Potosi	200
The railway from Uyuni to La Quiaca, on the Argentine frontier	500
The railway from the river Paraguay to Santa Cruz	750
Its prolongation to Suere	750
The railway from the Argentine Paraná and its prolongation to Tarija	300
From Rio Chimoré to Cochabamba	250
From Rio Beni to La Paz	500

For illustration there is appended the law of railroads, and several drafts of concessions sought from the government, and a map of the Republic of Bolivia.

JUAN FRANCº VELARDE.

LEGATION OF BOLIVIA,
Washington, February, 1890.

ACT RELATING TO RAILROADS.

Be it enacted by the Chamber of Deputies:

ART. 1. That the *Huanchaca Company*, of Bolivia, is guaranteed an annual interest of *six per cent.*, for a term of *twenty years*, on the capital which it may invest in the construction of the railway from Uyuni to Oruro. This guarantee shall be obligatory from the time that the railway reaches Oruro.

ART. 2. The estimate and cost of the line shall be verified by the nat onal engineer corps.

ART. 3. The company constructing the railroad shall open it to the public in Oruro within two years from the 1st of January, 1890, paying,

in case it should not then be completed, the fine of *four hundred thousand Bolivian dollars.*

ART. 4. The same annual interest of *six per cent.* is guaranteed, for twenty years, on the capital employed in the construction of a railway from the city of La Paz to the Peruvian frontier in the Department of Puno.

ART. 5. The same interest is guaranteed, for twenty years, on the capital invested in the construction of the railroads from banks of the river Paraguay and the Argentine frontier to Santa Cruz, the Beni, Tarija, and Sucre.

This concession refers only to the propositions presented to the legislature in 1889.

ART. 6. There is hereby granted to the companies constructing the railroads one square league of ground for each league of track laid; this ground to be in alternate lots, the remaining lands continuing to be Government property.

ART. 7. In case those companies should prefer the granting of lands they will not be entitled to the money guarantee.

ART. 8. The stipulations of responsibility for the payment of the granted guarantee shall not in any case affect the present national income.

ART. 9. All further stipulations bearing upon the present act are left to the power of the executive.

Let this be sent to the Senate for its action.

The Hall of the Chamber of Deputies in La Paz, October 27, 1889.

JENARO SANJINÉS,
President.
MARCO D. PARÉDES,
Secretary.
CASTO ROMÁN,
Secretary.

ANICETO ARCE,
Constitutional President of the Republic:

Whereas, the National Congress has authorized the following act:

Be it enacted by the National Congress:

That Mr. W. H. Christy is authorized to build a narrow-gauge railroad from the Desaguadero to the city of Oruro, with the following stipulations:

1. The railway of the Titicaca Company shall start from the highest navigable point of the river Desaguadero and run to Oruro, over the surveyed route approved by the company.

2. The road shall be a narrow one, with a gauge of 1 meter, with steel rails and ties; the rails shall weigh 30 pounds per meter, and the ties shall be placed at intervals of 800 millimeters. The locomotives shall weigh 15 tons, having a draught power of 400 tons and a maxi-

mum speed of 30 miles an hour. The rolling stock shall consist of one hundred and fifty cars and four locomotives.

3. This railroad shall be for freight, but it shall also transport passengers, for which it shall make use of suitable material.

4. The examination of the preliminary surveys shall be begun in the month of May, 1890, and shall be submitted for the approval of the Government on or before the expiration of ten months.

The final work shall be begun three months after the Government has notified the company of its approval of the plan and surveys made. After the expiration of this period, the concession shall be repealed.

5. The company shall be bound to carry the mail-bags gratis, to lower the price of transportation for Government employés 50 per cent., and and for government troops and materials 70 per cent.

6. The Government shall grant to the company, with full unincumbered title, all the land necessary for the road, its stations and necessary adjuncts, as determined in the respective plans.

7. The company shall always have the right of alienating the railroad owned by it, without being subject to other restrictions than those set forth in the act, provided that the Government be previously notified, which shall, conditions being equal, have the right of preference.

8. The passenger and freight tariff shall be fixed by the company, after its approval by the Government.

9. All materials destined for the construction and use of the railroad and its stations and other adjuncts shall be free from Government and municipal (*Octroi*) duty.

10. The employés of the railroad shall be exempt from service in the army and the national police.

11. The Bolivian Government, after the final work on the railroad is over, shall not grant any concession for another railroad through this same route, unless at a parallel distance of 15 miles.

12. The railroad of the Titicaca Company shall be opened to the public in sections of five leagues, according to the proscriptions and formalities of the law, the entire road being completed twenty months from the time the work was begun, or before that if possible.

Let this be forwarded to the Executive.

The Hall of the National Congress, La Paz, October 31, 1889.

SERAPIO RÉYES ORTIZ.
JENARO SANJINÉS.
EMETERIO CANO,
S. Secretary.
MARCO D. PARÉDES,
D. Secretary.

Therefore I promulgate it, that it may be and act as a law of the Republic.

Government Palace, La Paz, November 16, 1889.

ANICETO ARCE,
Minister of the Interior and Industry.

RAILWAYS OF BRAZIL.

*REPORT OF J. G. DO AMARAL VALENTE, DELEGATE FROM BRAZIL.**

DELEGATION OF BRAZIL,
Washington, February 27, 1890.

SIR: I have the honor to present to your excellency the accompanying synopsis containing a statement of the number and length of the railroads of Brazil, and of the capital therein invested.

I take this occasion of expressing to your excellency the assurances of my distinguished consideration.

J. G. DO AMARAL VALENTE.

Hon. F. F. VELARDE,
Chairman, Committee on Railway Communication.

Railroad system of Brazil, corrected to January 1, 1888.

Railroads.	Capital.	Length in kilometers.			
		In operation.	Building.	Under survey.	Total.
	Francs.				
Madeira-Mamoré (Estado do Amazona)	24, 500, 000	.....	.....	330	330
Belem-Bragança (Estado do Pará)	14, 900, 000	59	.....	150	209
Camocim-Sobral (Estado do Ceará)	25, 300, 000	129	.....	88	217
Baturité (Estado do Ceará)	25, 900, 000	111	.....	84	195
Natal Nova Cruz (Estado Rio Grande do Norte)	19, 975, 0 1	121	.....	.....	121
Conde d'Eu (Estado Parahyba)	18, 333, 883	121	.....	18	139
Recife-Palmares (Estado de Pernambuco)	46, 816, 479	125	.....	.....	125
Recife-Limoeiro-Timbáuba (Estado de Pernambuco)	15, 437, 328	96	46	.....	142
Recife-Caruarú (Estado de Pernambuco)	22, 000, 000	76	35	.....	111
Recife Caxangà (Estado de Pernambuco)	3, 580, 000	20	.....	.....	20
Recife-Olinda-Beberibe (Estado de Pernambuco)	1, 400, 000	12	.....	.....	12
Palmares-San Francisco (Estado de Pernambuco)	120, 000, 000	146	.....	500	646
Ribeirão Bonito (Estado de Pernambuco)	1, 685, 393	.....	22	38	60
Itatibense (Estado de Alagôas)	1, 200, 000	.....	19	.....	19
Maciô-Imperatriz (Estado da Alagôas)	12, 788, 826	88	.....	.....	88
Paulo-Affonso (Estado da Alagôas)	14, 300, 000	116	.....	.....	116
Jaraquá-Bebedouro (Estado da Alagôas)	700, 000	10	.....	.....	10
Bahia-Alagoinhas (Estado da Bahia)	44, 943, 820	123	.....	.....	123
Alagoinhas-Timbó (Estado da Bahia)	7, 443, 820	83	.....	.....	83
Alagoinhas-San Francisco (Estado da Bahia)	38, 200, 000	322	.....	131	453
Central Bahia (Estado da Bahia)	38, 514, 357	299	.....	3	302
Santo-Amaro Tacú (Estado da Bahia)	6, 741, 573	36	.....	.....	36
Nazareth Santo Antonio (Estado da Bahia)	3, 511, 236	34	.....	138	172
Caravellas-Philadelphia (Estado da Bahia)	33, 707, 865	142	251	.....	393
Victoria-Natividade (Estado da Bahia)	30, 600, 000	.....	.....	218	218
Itapemerim-Alegre (Estado Rio de Janeiro)	4, 494, 382	70	.....	208	278
Campos-Carangola (Estado Rio de Janeiro)	33, 707, 865	223	.....	84	307
Campos S. Sebastiaõ (Estado Rio de Janeiro)	1, 685, 393	18	.....	.....	18
Macahé-Campos (Estado Rio de Janeiro)	33, 707, 685	96	.....	.....	189
Santo Antonio de Padua (Estado Rio de Janeiro)	.....	93	.....	.....	.....
San Fedelis (Estado Rio de Janeiro)	5, 000, 000	.....	20	56	76
Estrado de Ferro Central (Estado Rio S. Paulo, Minas)	270, 855, 360	725	.....	.....	725
Estrado de Ferro Central (Estado Rio S. Paulo, Minas)	45, 000, 000	61	103	.....	164
Rio do Ouro (Estado do Rio)	3, 271, 999	65	.....	.....	65
Rio de Janeiro-Magé (Estado do Rio)	5, 617, 977	28	26	34	88
Corcovado (Estado do Rio)	1, 713, 674	4	.....	.....	4
Principe do Graõ Pará (Estado do Rio)	18, 258, 427	92	.....	.....	92
Santa Izabel do Rio Preto (Estado do Rio)	12, 668, 539	74	.....	.....	74

* Translation.

Railroad system of Brazil, corrected to January 1, 1888—Continued.

Railroads.	Capital.	Length in kilometers.			
		In operation.	Building.	Under survey.	Total.
	Francs.				
Rezende Arêas (Estado do Rio)	6,179,775	28	.....	65	93
Ramal de Cantagallo (Estado do Rio)	5,000,000	69	17	.....	86
Santa Anna (Estado do Rio)	8,400,000	39	.....	17	56
União Valenciana (Estado do Rio)	4,494,382	63	.....	.....	63
Rodero Vassouras (Estado do Rio)	350,000	6	.....	.....	6
Barão Araruama (Estado do Rio)	2,250,000	40	.....	.....	40
Rio das Flores (Estado Rio de Janeiro)	1,966,000	36	.....	.....	36
Alcantara-Maricá (Estado Rio de Janeiro)	2,300,000	.....	38	.....	38
Ramal Banalalense (Estado Rio de Janeiro)	2,275,000	12	17	.....	29
Magé Theresopolis (Estado Rio de Janeiro)	5,618,000	.....	6	40	46
Leopoldina-Cantagallo (Estado Rio de Janeiro)	140,449,438	297	.....	.....	1,204
Minas-Rio (Estado de Minas Geraes)	43,525,992	170	.....	.....	170
Juiz de Fóra-Piau (Estado de Minas Geraes)	5,056,180	52	9	.....	61
Oeste de Minas (Estado de Minas Geraes)	13,900,674	218	103	56	377
Pitangui (Estado de Minas Geraes)	16,853,933	.....	.....	242	242
Mogyana (Estado de Sao Paulo)	56,460,674	551	188	.....	739
San Paulo-Rio de Janeiro (Estado de Sao Paulo)	29,957,865	232	.....	.....	232
Santos-Jundiahy (Estado de Sao Paulo)	68,664,170	139	.....	.....	139
Araraquara Rio Grande (Estado de Sao Paulo)	55,000,000	.....	.....	531	531
Sorocabana (Estado de Sao Paulo)	33,707,865	222	110	44	376
Itúana (Estado de Sao Paulo)	5,765,730	220	40	23	283
Paulista (Estado de Sao Paulo)	56,179,775	242	.....	.....	242
Bragantina (Estado de Sao Paulo)	6,516,854	52	.....	.....	52
San Carlos do Pinhal (Estado de Sao Paulo)	14,044,014	264	.....	.....	264
Rio Pardo (Estado de Minas Geraes)	2,200,000	36	.....	.....	36
Taubaté-Tremembé	600,000	9	.....	.....	9
San Paulo Santo Amaro (Estado de Saõ Paulo)	1,200,000	20	.....	.....	20
Santos S. Vicente (Estado de Saõ Paulo)	600,000	9	.....	.....	9
Paranagua-Coritiba (Estado do Paraná)	50,000,000	111	.....	.....	111
Dona Thereza Christina (Estado de Santa Catherina)	18,253,184	116	.....	.....	116
Taquary-Uruguayana (Estado do Rio Grande do Sul)	102,900,000	262	112	269	643
Rio Grande Bagé (Estado do Rio Grande do Sul)	41,814,831	280	3	.....	283
Bagé-Cacequi (Estado do Rio Grande do Sul)	25,000,000	.....	.....	210	210
Quarahim-Itaqui (Estado do Rio Grande do Sul)	19,975,031	75	101	.....	176
Porto-Alegre Nova Hamburgo (Estado do Rio Grande do Sul	10,000,000	43	.....	.....	43
Total	1,555,916,159	8,486	1,398	3,597	13,481

J. AUGUSTO DA COSTA,
Secretario do Delegaçaõ dos Estados Unidos do Brasil.

THE RAILWAYS OF CHILI.

*REPORT OF EMILIO C. VARAS, DELEGATE FROM CHILI.**

LEGATION OF CHILI,
Washington, January 9, 1890.

DISTINGUISHED COLLEAGUE: In reply to your favor of the 7th, which I received to-day, and according to the desire therein expressed, I enclose a part of the Statistical Synopsis of Chili in which you will find a list of the railroad lines constructed in Chili and those under construction, together with a table of the length of each in kilometers, and of the points or places which they connect.

To the railroads in construction mentioned in the Synopsis, are to be added the two which in a short time will unite the Central Railroad of Chili and the railroads of the Argentine Republic, and which are being at present constructed between the Andes (Chili) and Mendoza (in the Argentine Republic), and between Zumbel (in Chili) and Bahía Blanca (in the Argentine Republic).

The laying of another line is at present contemplated between Valparaiso and Santiago, and the plan of a railroad between Serena and Tarapacá is being prepared, to which end the Government has asked from Congress the funds necessary. This line will connect with the Central Railroad which already runs to the southern extremity of the Republic.

In the same synopsis you will find the data relating to the cost of construction, transportation of passengers, carriage of freight, etc., of the railroad lines of the State.

As for plans, proposals, and estimates relative to all these railroad lines, they do not exist, as you will suppose, in the records of this legation; they are to be found in the archives of the Direction of Public Works of Chili, and it would not be easy to get them here. I hope, however, that they will not be necessary to the purpose of your committee.

With expressions of my most distinguished consideration, I am, your obedient servant,

E. C. VARAS.

Hon. JUAN FRANCISCO VELARDE,
E. E. and M. P. of Bolivia, present.

* Translation.

[Extract from the statistical and geographical synopsis of Chili.]

DEPARTMENT OF INDUSTRY AND PUBLIC WORKS.

PROMOTION OF INDUSTRY.

The development of industry is being rapidly promoted. The National Society of Agriculture of the capital, and the Southern Agricultural Society, the Agricultural Institute by its principal branches of general agriculture, and the practical schools for its teaching and application, established in the towns of Santiago, San Fernando, Talca, Chillán, Concepción, Vicuña, and Salamanca are all working for this end. The mining industry is receiving equally close attention from the National Miners' Association and the practical schools of this branch kept up in Santiago, Copiapó, and Serena. There is also in the capital a Society for the Improvement of Manufactures, a School of Arts and Trades, and a Bureau of Architecture, devoted to the promotion of manufacturing interest, building, etc.

Lines of railroads of the State now in operation.

	Kilometers.	Average cost per kilometer (gold).	Total cost.
Santiago to Valparaise	187.0	$69,781	$13,049,473
Andes Branch	45.0	22,783	1,025,235
Santiago to Curicó	185.0	32,171	5,951,635
Palmilla Branch	39.0	9,820	422,260
Curicó to Chillán	210.9	28,412	5,994,932
Chillán to Talcahuano	187.5	26,436	4,956,750
San Rosendo to Angol	73.0	28,070	2,049,110
Santa Fé to Los Angeles	22.0	28,070	617,540
Angol to Traignén	72.0	55,982	4,030,704
Renaico to Fort Victoria	75.0	55,982	4,198,650
Roblería to Collipulli	42.0	.....	.....
Chanaral to the mineral springs, Ánimas and Salado	60.0	5,842	350,520

Movement of passengers, freight, and baggage in 1887.

Classes.	Passengers.		Freight.		Value of baggage.
	Number.	Value.	Weight.	Value.	
			Metric cwt.		
First	1,112,597	$793,630.25	5,026,714	$1,114,224.46	$88,308.82
Second	802,354	638,300.00	4,737,339	1,675,518.49	68,443.28
Third	543,359	468,909.05	3,637,939	1,122,943.26	63,925.75
Total 1887	2,458,310	1,900,839.30	13,401,992	3,912,986.21	220,677.85
Total 1886	.....	.....	13,062,575	3,691,727.24	234,106.31
Difference	.....	.....	339,417	221,258.97	13,428.46

The total receipts of the railroads of the State in 1887 were $6,349,621.30; the expenses amounted to $4,197,250.66, leaving a clear gain of $2,152,370.64.

The private lines of railroads in operation are, commencing from the north:

	Kilometers.
From the port of Arica to the city of Tacna	63
From the port of Pisagua to Tres Marías, 90 kilometers, and branches to Agua Santa and Puntunchara with sidings	106
From that of Iquique to Tres Marías, 109 kilometers, to Virginia, 31 kilometers, branches to Bodegas with sidings	82 194
From that of Patillos to Salitreras de Sur	93
From that of Mejillones del Sur to the Cerro Gordo mine	29
From that of Antofagasta, via Salinas el Dorado to the village of Calama, continuing eastward in the direction of the borate deposits of Ascotán on the frontier of Bolivia, and which is to continue some kilometers into the interior of this state to the rich silver mine of Huanchaca	440
From that of Taltal to Cachiyuyal or El Refresco	82
From that of Caldera to the city of Copiapó, branching at the mines of Puquios to San Antonio de Apacheta and to Chanarcillo or Juan Godoy	242
From that of Lower to Upper Carrizal, via Baranquilla and Canto del Agua, 36 kilometers, and thence 45 more to the Cerro Blanco Mine on the east	81
From that of Coquimbo to the city of La Serena and La Compañía	15
From the same to the city of Ovalle with branch to Panulcillo	123
From that of La Serena to Elqui, or to the village of Rivadavia east of the city of Vicuna	78
From that of Tongoy to the mine of Tamaya	55
From that of Laraquete, in the bay of Arauco, to the coal mines of Quilachauquin and Maquegua	40
Total	1,641

Or 1017.4 miles.

RAILROAD LINES UNDER CONSTRUCTION.

The Congress has recently approved a contract made by the Executive with Mr. Newton B. Lord for the construction of the ten lines hereafter mentioned upon the basis of an estimated sum.

The total cost of these works amounts to the sum of £3,542,000 sterling, including in this sum the 13 per cent., to which the excess over the value of the estimates first made amounted.

Only the lines and their distances in kilometers can be noted here, and not the cost of each, because it is not yet known what changes can be made, either in their length or in the alteration of the gauge from wide to narrow, and *vice versa*.

If, for example, the line from Victoria to Osorno be taken, the cost much exceeds the estimates.

The average cost per kilometer, including equipment, etc., is about $27,000, more or less. Thirteen per cent. may be taken as the average excess of cost over that first estimated; thus, for instance, there are lines, the actual cost of which has been 8 per cent., 13 per cent., and in the case of that between Constitucion and Talca, 28 per cent. over the original estimate.

The following table will give the names of the several lines with the extent of each:

	Kilometers.
Ovalle to San Marcos	60
Vilos to Illapel and Salamanca	128
Ligua to Calera and Cabildo	76
Santiago to Melipilla	59
Pelequen to Peumo	35
Palmilla to Alcones	45
Constitucion to Talca	85
Coihue to Mulchen	43
Victoria to Osorno and Valdivia	403
Huasco to Vallenar	48
Total	928

Or 608.84 miles.

THE RAILWAYS OF COLOMBIA.

*REPORT OF MARTINEZ SILVA, DELEGATE FROM COLOMBIA.**

WASHINGTON, *January* 10, 1890.

DEAR SIR AND FRIEND: I send you herewith the information I have been able to collect about the railroads of Colombia. I am expecting a map which I have been advised has been sent, and when I receive it I will take pleasure in forwarding it to you to illustrate the notes appended hereto.

Your obedient servant and friend,

CARLOS MARTINEZ SILVA.

Mr. JUAN F. VELARDE,

Chairman, Committee on Railway Communication, Present.

RAILROADS IN COLOMBIA.

The Republic of Colombia has a population of 4,000,000 inhabitants, with an extent of territory of 13,310 square myriameters, of which 10,354 are uncultivated.

The population is densest along the Atlantic coast, and especially in the interior of the country in the high regions where the climate is mild and healthy and the soil suitable for agriculture.

The highway for communication with the exterior is the River Magdalena, which waters seven of the nine departments into which the Republic is divided, and empties into the Atlantic through the two mouths *Ceniza* and *Rio Viejo*. The Magdalena is navigable for vessels of smal, draught (3—3½ feet) from a little below Honda to Barranquilla. This part of the river is called *Lower Magdalena*. In the dry season its waters diminish greatly, rendering navigation difficult and even dangerous, at least between Honda and the point called Nare. *The Upper Magdalena*, that is to say, from Honda to its source, is also navigable to a great extent (between Honda and Neiva), but there the scarcity of water during a large part of the year is still more noticeable, which renders navigation very irregular and dependent upon circumstances.

The Magdalena being the principal highway of Colombia, and traversing the richest and most populous departments, it is easily understood that the tendency there has been to connect this river with the principal

* Original.

centers of production and consumption. For this reason there is nothing in Colombia corresponding to a *railroad system;* the existing lines, those under construction, and those contemplated are all short, isolated, and independent.

From the first the need which was most urgently felt there was that of communication between the capital of the Republic (Bogotá) and the Magdalena. With this in view, the construction of a railroad was commenced which was to connect Girardot, a port on the Upper Magdalena, a little above Honda, with the table-land on which Bogota is situated (9,000 feet above the sea level). Of this road some 40 kilometers are already constructed, and there remain about 45 more to be built to connect it with the railroad on the plain of Bogota, between that city and Facatativá (37½ kilometers), at the branch line running southward towards the aforesaid railroad of Girardot. The part of this work yet to be finished is relatively the most difficult and expensive, since it must ascend the cordillera, which, as may be deduced from the height of Bogotá, is very high and abrupt.

Even when this road is completed it will not be of great utility for outside trade, since it does not avoid that part of the Magdalena which is most liable to accidents and dangers on account of low water in the river during a large part of the year, and since it requires a transshipment at Honda, where there is a rapid which interrupts navigation between the Upper and Lower Magdalena.

To partly avoid this difficulty another short line of railroad has been constructed, called the *Dorada* (23½ kilometers), between a point below Honda and another above that city.

The *Antioquia Railroad* starts from Puerto Berrio, on the Magdalena, and runs to Medellin, capital of the rich and densely populated department of Antioquia. Fifty kilometers of the most difficult and expensive portion have been constructed. This railroad belongs to the Government of the department, which is disposed to make very liberal offers for its completion. It would be a fine investment for foreign capital.

Another very important line, and one which would yield large dividends, would be the one which would connect the city of Bucaramanga with the River Magdalena. Bucaramanga is the capital of the rich and industrious department of Santander. It is one of the most prosperous cities of the Republic, and is the center of a region which produces large quantities of excellent coffee. The road would be a short one, has been accurately surveyed, and its construction offers no great difficulty.

Another line of railroad is that which runs from Barranquilla, on the Magdalena, to Puerto Colombia on the Atlantic (22 kilometers), which is the place where to-day the greater part of the exports and imports of the Republic are made. The construction of this railroad was made necessary because the mouth of the Magdalena called Ceniza is unnavigable on account of the sand-banks formed there in the struggle between the waters of the river and the sea.

Nevertheless, Puerto Colombia, is not, and never can be, a convenient port, because vessels have to anchor at a considerable distance from the shore.

The best ports of Colombia on the Atlantic are Cartagena and Santa Marta, but the latter city, once very important on account of its communication with the Magdalena, has eventually become cut off from it. An attempt is now being made to re-establish this communication by means of a railroad of which 45 kilometers have already been built. It is under the direction of a private company, backed by European capital.

Those just enumerated are the railroads which communicate with the Magdalena.

Completely independent of these are three others:

That of *Panama*, which crosses the Isthmus between Colon and Panama (76½ kilometers).

That of *Cúcuta*, between that city (which is the southern-most one of the republic), on the frontier of Venezuela, and the river Zulia, by which is exported all the coffee of that part of Colombia and the neighboring states of Venezuela. It is 55 kilometers long, and is an excellent line, constructed with domestic capital and by native engineers, as was also that of the table-land of Bogota.

That of the *Cauca*, starting from the port of Buenaventura and running to Calí, a very important city of the highly fertile valley of the *Cauca;* 21 kilometers of this have been laid, and a European company has recently taken charge of its completion.

From what has been set forth it may be concluded that what Colombia most needs to-day is to construct or finish lines connecting Bogotá Bucaramanga, and Medellín with the Magdalena. A railroad which would ascend this river from Cartagena to Bogotá would obviate all the difficulties of that slow and uncertain navigation. The work would not present serious difficulties of engineering, and would rapidly open up the immense tracts situated along the river, which are exceptionally fertile and rich in all kinds of woods and vegetable products.

As for a railroad to go through Colombia toward the southern republics, I believe that the only possible route would be that of the Lower Magdalena, ascending to Bogotá, crossing the eastern chain, of easy access at many points, and then descending to the immense plains which form the basin of the Amazon and its affluents. Such a work would be colossal in its extent, and would have to be carried through a region of unbroken wilderness, although of a fertility beyond belief. At all events, the enterprise would be worthy of the skill and daring of the people of the United States.

CARLOS MARTINEZ SILVA,
Delegate from Colombia.

WASHINGTON, *January* 10, 1890.

THE RAILWAYS OF COSTA RICA.

*REPORT OF MANUEL ARAGON, DELEGATE FROM COSTA RICA.**

WASHINGTON, *January* 5, 1890.

SIR: In accordance with our conversation relating to the commission, over which you preside so ably, charged with making a report to the above-mentioned congress upon the railroad communications in Spanish-American countries, I have the honor to transmit the following data, wherein I have tried to condense the information concerning Costa Rica's interests in that important question.

The Republic of Costa Rica is situated on the southern part of Central America, between 8° and 11° 16′ north latitude and 81° 40′ and 85° 40′ west longitude, Greenwich meridian. Its territory covers an area estimated at 25,000 square miles, and its limits are as follows: On the north and east it is bound by the Republic of Nicaragua and the Caribbean Sea; on the south and west by the Pacific Ocean and the State of Panama, in the Republic of Colombia.

The Cordillera of the Andes passes through the country from northwest to southeast, and from it are separated the mountains which cross it in every direction, thus forming high lands, immense valleys, and extensive coasts, leaving the territory divided in three different regions: the high-lands, those lying between them, and the slopes of the mountains, and those formed by the coasts in extensive and extremely fertile plains.

The Cordillera of the Andes bears various names in Costa Rica; a part of it, called Mountain of Dota, occupies the central portion of the territory; others are named the Poás and Barba Mountains, which meet on the summits of Irazu and Turrialba and end on the Atlantic coast. Those of Poás and Barba stretch a little toward the north. On the south of Turrialba and on the east of Dota rises the peak of Chirripó, and on a line almost parallel with the littoral of the Atlantic continue the mountains of Lyon (Ujum), Pico Blanco (Kanaic), Pico Rovalo, and the Cordillera of Chiriqui. On the northwest side, with the mountains of Poás, follows the chain forming the hills called Los Guatusos, Tilarán, Cerro Pelado, Tenorio, Miravalles, Rincon de la Vieja, and Orosi. Another important range extends from the mountain of Herradura and joins the great mountain of Dota on the eastern side; between both points are comprised the plateaus of Turrubales, Puriscal, and Candelaria. In that manner the principal altitudes of Costa Rica meet together, and are divided throughout the country in numerous

* Original.

and varied regions, among which attention must be called to the mountain of Aguacate (formerly called Terroto), celebrated for its mineral wealth, especially in gold and silver.

The several heights referred to have been measured and the following is the result:

	Feet (English).
Pico Blanco	11,800
Volcano Irazu	11,500
Volcano Turrialba	11,350
Volcano Poás	8,895
Volcano Barba	8,700
Pico Rovalo	7,012
Alto Chomozo	5,265
Volcano Orosi	5,200
Miravalles	4,700
Mountain Aguacate	4,132

The whole territory is crossed by rivers and small streams bringing fertility everywhere, and offering great inducements to various industries, which will find sufficient motive power in the currents for all kind of machinery.

The principal rivers coursing toward the Pacific are the Tempizque, which, uniting the waters from almost the entire province of Guanacaste, empties into the Gulf of Nicoya. That river, like a great many of its tributaries, is navigable for many miles for boats drawing 4 or 5 feet of water. Then comes the Barranca River, which empties east of Puntarenas, the Jesus-Maria River, and the Rio Grande, all of which empty in the same Gulf of Nicoya. The Pirris, Naranjo, Savegre, Baru, and Rio Grande de Terraba empty directly into the Pacific Ocean. The Dulce, El Coto, Pavon, and other rivers of lesser importance flow into the Gulf Dulce. The Frio River, navigable to a considerable distance, empties into the Lake of Nicaragua at the very place where the San Juan River begins. The Zapatero, Viejo, Negro, and Platanares Rivers also empty in the same lake. The San Carlos and Sarapiqui are tributaries of the San Juan, whose course runs between Costa Rica and Nicaragua toward the Atlantic. The Sucio River is divided between the Sarapiqui and the Colorado, thus facilitating the communications with an extensive territory.

In the Caribbean Sea, or of the Antilles, empties directly the Colorado River, which in its widest part receives the waters of the San Juan and to its outlet on the Atlantic; the Parisimina, wherein the Reventazon empties itself, and whose source is southwest of Cartago; the Pascuara and Matina, communicating together by great creeks, and the Toro or Morin. All these rivers are situated on the northern side of Port Limon, as well as the Penitencia, Suerte, Palacio, Tortuguero, and Sierpe, of smaller importance, which empty in a creek communicating with the Sea of the Antilles at the point called Tortuguero. South of Port Limon, empty the Limon, Banana, Bananita, and

other shallow rivers. The Telire or Sixola River passing through a great tract of land, and the Tilorio or Chanquinola, celebrated under the name of the Estrella River, empty in a more southerly direction after irrigating with its numerous tributaries the important territory of Talamanca. The Bananas, Barras, Rovalo, and other rivers of little consequence empty in Admiral Bay.*

The climate of Costa Rica is remarkably mild and healthful. There is no extreme heat or cold, neither are there endemic or virulent diseases. The mean temperature in the high-lands is from 14° to 20° centigrade, and from 20° to 26° on the coast.†

It can be said that there are but two seasons; the dry one and the rainy one. The first is from November to May; in the latter the rain generally begins and lasts until November. In either of those seasons the sun rises, with a difference of a few minutes, at six in the morning and sets about the same time in the evening.

Storms, cyclones, and hurricanes, which in other localities cause so much damage, are unknown in Costa Rica, nor is there any danger of inundations on account of the heavy rains, owing to the peculiar configuration of the country.

The present population of the Republic, according to the report of the Bureau of Statistics for 1888, is 205,000 inhabitants of European origin; the homogeneity of the white race of Spanish descent being very notable. There are neither negroes nor Asiatics, and the Indians are in so small a proportion that they are not considered important enough to be mentioned in the census. The number of foreigners residing in the country can be estimated at 8,000, and is composed mostly of Germans, French, English, and North Americans.

The principal port of Costa Rica on the Atlantic is Limon, situated about 10° north latitude, and 83° 4′ west longitude, Greenwich meridian. On the Pacific the principal port is Puntarenas, on the Gulf of Nicoya, and is also about 9° 58′ north latitude by 84° 46′ of same longitude; the distance, therefore, in a straight line between the two ports being 1° 42′, or from 102 to 103 geographical miles.

The Republic is divided into five provinces and two *comarcas*, and the principal cities are situated as follows:

Provinces.	Cities.	Latitude north.	Longitude west.
		° ′	° ′
San José	San José	9 56	84 6
Cartago	Cartago	9 54	83 58
Heredia	Heredia	9 59	84 9
Alajuela	Alajuela	9 59	84 15
Guanacaste	Liberia	10 32	85 15
Comarcas:			
Puntarenas	Puntarenas	9 58	84 46
Limon	Limon	10	83 4

* Costa Rica in 1886, by J. B. Calvo.

† Costa Rica y su Futuro, by Paul Biolley.

The cities of Alajuela and of Heredia are northeast of San José, at a distance of 7 and 14 miles (English) respectively; and Cartago, southeast of the above-mentioned city of San José.

These cities are the most important of Costa Rica, and their heights above sea-level are as follows:

	Feet.
San José	3,868
Cartago	4,930
Heredia	3,786
Alajuela	3,001

From the total of the population corresponding to each of the provinces, according to the division previously made, the number of inhabitants is as follows:

San José	64,000
Alajuela	51,000
Cartago	34,000
Heredia	29,500
Guanacaste	16,000
Puntarenas	8,500
Limon	2,000

The principal products of Costa Rica consist in coffee, dye and cabinet woods, bananas and other fruits, hides, skins, mother-of-pearl, sarsaparilla, cocoa-nuts, etc.

The value of the importations of foreign merchandise in 1888 amounted to $5,203,000, corresponding to an average of $25.30 for every inhabitant; and the exportations during the same year were $5,714,000, or an average of $27.87 per capita.

Of the value of the importations, those from the United States represent a sum of $1,794,000, equal to about 33½ per cent. of the whole importations; and the value of the exportations to the United States was $2,077,000, or about 36½ per cent. of the total value of the exported products.

The importations from the United States to Costa Rica consist mainly in cotton goods, tools, machinery, and provisions. The exportations from the latter to the former are principally coffee, fruits, hides, skins, and India rubber.

The national revenues in 1888 amounted to $3,687,595, a sum which, divided among the population according to the calculation made, gives an approximate contribution of $18 per inhabitant.

The roads in Costa Rica are national and municipal. The national are those which communicate with the principal centers of population, and the latter with the ports of entry. Their construction and maintenance are paid out of appropriations made by the state, and for this reason are controlled by the Minister of Fomento. The municipal roads are those which connect the smaller populations with the larger ones or with the principal cities, and extend their branches in every inhabited or producing locality. These roads, for the most part, are splendidly built, and would be thought admirable everywhere.

The cities of Cartago, San José, Heredia, and Alajuela, besides their extensive and contiguous roads and national highways, connect with each other by railroad, and the trains, at present, make three regular daily trips between the 28 miles which separate the former from the latter cities.

The railroad called the Atlantic line, starts westward from Port Limon and arrives at Reventazon, thence branches off in two directions, one southwest, to connect with the Central Railroad running between Cartago and Alajuela already referred to; and the other, going northwest, crosses the fertile plains of Santa Clara and, for the present, terminates at Carillo. The plain of Santa Clara contains a great number of valuable banana plantations, stock farms, etc.; the same can be said of the Valley of Matina, west of it, and the favorable locality for the cultivation of cacao, which produces a crop of excellent quality.

The length of the railroad from Limon to Cartago is 95 miles, and from Limon to Carillo about 72 miles, due, in both cases, to the sinuosities of the ground near the ascent toward the interior.

From Cartago to Puntarenas, on the Pacific, there is a magnificent national highway, very uneven at the part crossing the summit of the mountain of Aguacate, but which continues in that direction for the purpose of maintaining easy communications with the rich gold and silver mines that are exploited in that mountain so favored with great mineral wealth. The height of the summit of that mountain, where the road referred to crosses it, is 4,132 feet above sea-level. There is between Alauela and Puntarenas quite a number of small populations, and, among them, three important towns, such as Atenas, situated at 2,380 feet above the sea; San Mateo, at 1,050 feet, and Esparta, at 718 feet.

From Esparta to Puntarenas, besides the highway the first section of 14 miles of the railroad of the Pacific line has been constructed and is now in operation.

From Esparta to San Mateo the distance will be 12 miles; the same from San Mateo to Atenas, and from Atenas to Alajuela. The total number of miles of the highway from the latter city to the above-mentioned port is over 50 miles long on account of the uneven road across the mountains.

There is another highway which had been very important for the communications with Limon by the railroad ending at Carillo. It is the one starting from San José in the direction of La Palma, crosses that height at 5,000 feet above the sea, and descends to Carillo, which is only 1,400 feet high. That highway is 25 miles long, and it must be observed that in a distance of 17½ miles separating the two places referred to the difference of the level between both is 3,600 feet.

There was always a project of an interoceanic railroad. The national congress made an appropriation of $25,000 for a final survey of the part to be built between Alajuela and Esparta, and the Govern-

ment received proposals for its construction. It is also intended to build a branch to the port of Tivives, though not a port of entry, but which could be made one, owing to its excellent conditions of security and for its facilities.

A new railroad is nearly completed, which is to run across the regions of the country that excite the most the desires of the settlers on account of the great abundance of beautiful cabinet woods, dye-woods, and timber to be found in those localities, as well as for the richness of the soil for agricultural pursuits. That line is to start from Jimenez, on the Atlantic Railroad, nearly 10° 10′ north latitude, and 83° 45′ west longitude, Greenwich meridian; taking a north-northwest direction, it will cross the Sarapiqui River at the point called El Muelle, or at another more or less immediate; thence taking a northwest direction it will continue to the Frio River at its entrance on the Nicaraguan territory.

This new road will open, as already stated, one of the richest regions of the country, and though the hope that the interoceanic canal may be constructed within a few years, or that the realization of that great enterprise may be delayed longer, the railway from Jimenez to Frio River will give life to and develop many important undertakings. Even supposing that the lands should not be, as they are in reality, adapted to every kind of cultivation, the fact alone of facilitating the exploitation of the forests which, to-day, contain an immense amount of India rubber and other trees of different species, as already said, would justify the efforts made by the Government for the construction of the line alluded to.

Upon the accompanying map has been marked, in black, the probable direction which the said railroad shall follow. Its length will be about 80 or 90 miles from its starting-point.

The land communication with Nicaragua begins at a place called La Barranca, close by Esparza; crosses the entire Province of Guanacaste, a distance of 90 or 100 miles, and, though in the dry season the traffic is made by carts, during the rainy one it can only be carried by means of beasts of burden, owing to the even surface of the road, which does not give to the waters a sufficient incline to run off, nor absorb them quickly enough to make it passable.

In a southwest direction, starting from Candelaria, south of San José, and partly following the Pacific coast, there is a bridle-path that passes through the land occupied by the native population of Terraba and Boruca, and ends on the Colombian frontier. The length of that path, crossing through places almost depopulated, added to the facilities of communication by steam with Panama, causes the traffic to be made by sea to Colombia instead of by the road referred to.

There is a path which starts from Angostura, east of Cartago, and leads to the localities southeast of the territory inhabited by the Indians of Talamanca, who use it only on account of its being more easy and accessible to those distant regions by way of Limon and Puerto

Viejo (Old Harbor), being near that point, and with which they communicate by a bridle path.

The distance of the railroad from the Atlantic to the frontier of Colombia, can be calculated at 120 miles in a direct line; but, were it a question of a railroad between both places, the length could not be estimated at less than 150 miles, owing to the configuration of the land and to the consequent deviation from the straight line.

PROJECT OF A RAILROAD THROUGH THE LENGTH OF THE COUNTRY.

From the preceding remarks, it is clearly seen that the railways constructed in Costa Rica follow a transversal direction from the one to be taken by the projected line lengthwise of the continent, and that only the road from Jimenez to the Frio River could form a part of that great line if, touching it on the Costa Rican territory on the northern frontier, it was directed or laid toward the Frio River; but, as the railway system in Nicaragua tends toward Granada, it can not be indifferent to that republic to connect the city of Rivas with that railroad, it is natural to suppose that, in such a case, the line would reach Costa Rica west of the Lake of Nicaragua, and the track run south, more or less parallel with the shore of said lake and join the road of Jimenez to the Frio River.

But leaving the latter supposition and taking for granted that from the northern shore of the above mentioned lake, the railroad shall pass south of Costa Rica, that Republic would see with great interest the intercontinental road cross the territory of Guatusos to its connection with the Jimenez and Frio River line branch, already referred to, on account of the immense advantages to be derived from the opening of these extensive and rich lands. Besides the economy of construction, the enterprise would find ample means of sustenance, according to the natural features of the soil, all offering every desirable condition as to the cost, as well as to the interests it would develop.

The extension of that part of the road, about 60 or 65 miles, would give an impulse to all the natural resources, as well as to a thousand various undertakings that would be started, not only on the plains of Guatusos, but also on those of San Carlos, to which would be added the movement of the great interests already existing in the region of Santa Clara. By that connection, the expenses of the construction of about 80 miles of the proposed transcontinental railway would be more economical.

Supposing the above idea be accepted, and establishing Matina as the starting point south, the southeast line would extend about 120 miles toward the frontier of Colombia and pass through very fertile lands, where there is an abundance of timber, brush-woods, etc., and a great variety of minerals. It results, therefore, that the railroad from the limit of Nicaragua, following the Atlantic coast to the frontier of

Colombia, would cross the territory of Costa Rica on a line of about 200 or 220 miles long.

A similar project, to be realized on the Pacific side, would include something like 50 miles more than the preceding one; that is to say, between 250 and 260 miles in length, and much nearer to the Pacific coast, so as to follow it almost on a parallel line, but it would not pass through such rich localities, nor offer such a bright future like those above mentioned.

I considered proper to transmit to you the data contained in this communication, bearing upon the topography of the country, so as to convey an idea of the position of the Cordilleras and principal mountains, in order that their configuration may be well understood; and by this means help to decide upon the most convenient line for the projected transcontinental railroad passing through the Costa Rican territory. In the same manner I have thought useful to furnish the statistics in this report, as they indicate with sufficient correctness the resources upon which the Republic relies to-day. From them, therefore, it will be easy to judge of the development they would receive in a given time, impelled forward by an enterprise of such magnitude. In regard to the position of the existing railroad lines, the accompanying map will help to show it.

There remains but one more observation, and it refers to the number of inhabitants in Costa Rica, which has been calculated upon the most exact figures furnished by the Bureau of Statistics; and, as you are well aware in making a census there are often many errors, owing sometimes to unavoidable omissions, that of Costa Rica, being made quite a long time ago, does not contain the indigenous population; nor has another edition been published for some years past to make the necessary corrections. For this reason the actual population is estimated at not less than 225,000 inhabitants, according to the opinion of various writers well acquainted with the country; still, it ought to be estimated higher if the relation which always exists between the total of inhabitants and the number of soldiers and that of children attending schools is taken into consideration.

In the hope that what precedes will prove of some use to you, I have the honor to be, sir,

Respectfully, your obedient servant,

MANUEL ARAGÓN.

Hon. Sr. Don JUAN F. VELARDE,
Delegate from Bolivia to the
International American Congress, present.

WASHINGTON, *January* 13, 1890.

SIR: In answer to your favor of the 7th instant, I have a great pleasure in transmitting herewith the information you were pleased to in-

dicate, thus supplementing that contained in my communication of the 5th instant.

The cost of constructing railroads in Costa Rica varies, of course, according to the conditions of the lands they have to pass through, the value of private property to be expropriated, and the topographical difficulties to overcome in different places; but judging from past experience the highest cost could be estimated, at the most, between $60,000 and $70,000 per mile, equipped with its corresponding rolling-stock, machine shops, and other necessary appurtenances. It must be observed that the present lines cross the Cordillera, and that until now none has been constructed running parallel to it.

The general traffic at the ports of the Republic, taking as a basis the quantity of imported merchandise and exported products, not only in the rough weight, but also in the bulk or capacity as when received on board the vessels, could be estimated at 66,500 tons, and the traffic of the interior, though its importance is not entered on the official records, could be put at 40,700 tons.

About 50,000 tons of the general traffic are carried by the Atlantic Railroad, and should it increase in proportion to the progressive development of the country during the past five years it can be expected that within the same lapse of time it will augment at least 40 per cent. of its actual importance.

The freight per ton by the line above mentioned is $17 in American gold.

The earnings from the freight and passengers deducted from the corresponding expenses give an annual profit of over 10 per cent. on the invested capital.

I have the honor to remain, sir, your obedient servant,

MANUEL ARAGÓN.

Hon. Sr. Dn. JUAN F. VELARDE,
Delegate from Bolivia to the
International American Congress, present.

THE RAILROADS OF ECUADOR

REPORT OF MR. J. M. P. CAAMANO.

My VERY DISTINGUISHED FRIEND AND COLLEAGUE:

In accordance with your request that the various Delegates composing the Committee on Railroads furnish some data relative to railroads in their respective countries, I have the honor to give the following:

The construction of railroads in Ecuador began in 1872 under the administration of Mr. Garcia Moreno by commencing the road of Yaguachi, to place the coast provinces in connection with the capital of the Republic and the provinces to the east and north of Guayaquil. Various difficulties made this work slow, and during said administration up to 1875 about 70 kilometers, to a point called "Barraganetal," were built. Afterwards, during the administration of Presidents Barrero and Veintimilla, the same line was extended to the vicinity of the Chimbo River that marks the limits of the coast lands and the beginning of the Cordilleras of the Andes. Later on, and under the administration of the undersigned, work was renewed on the line from February, 1884, to June, 1888, by virtue of a contract entered into with Mr. Marcus J. Kelly and by the executive power, and approved by Congress in 1885; according to which, 82 additional kilometers were to be constructed from Chimbo to Sibambe.

The contractor has encountered many obstacles, the principal one being lack of laborers; for Ecuador has only a population of 1,500,000 inhabitants; and as the agricultural industry absorbs most of the workmen, it is difficult to find any considerable number of hands. At the commencement, the contractor associated with him some Guayaquilian capitalists, and with them secured a loan in Europe; but this loan has not proved sufficient, and to-day they are making arrangements to overcome all obstacles and finish the contract. The road being once finished to Sibambe, and the serious difficulty of passing over the western range of the Cordillera surmounted, the prolongation of the line some 300 kilometers, more or less, to the capital is very practicable.

A syndicate of European capitalists have made a proposal to the Government, which, among other things, contemplates the finishing of the railroad alluded to, not only to the capital but to Ybarra, an important city situated about 90 miles to the north of Quito.

It is not possible for me to assure you that this proposed plan will be realized; but I know that the President, devotedly interested in the progress of the country, has called an extra session of Congress that

will assemble on the 15th of May and will interest itself principally in this matter.

From Sibambe to Quito and thence to Ybarra this line will encounter less difficulties to construct; because in the provinces of the interior the climate is healthy, and it is easy to obtain workmen. Moreover, wages are very low, and the railroad can take in its line some sections of a wagon road we have, having a length of some 200 kilometers. This wagon road, on account of its width, accommodation, and one hundred and sixteen bridges (among them are true works of art), it can be said, is one of the best roads in the world. There are a number of contractors ready to undertake the construction of a road from Sibambe to Quito, and I have no doubt but that a contract will be made before the conclusion of the year. This line would open up a wide field for the development of fertile lands, and very rich are those lying between the two ranges of the Cordilleras. This section is the center of a population noted for agricultural pursuits, and comprising such towns as Alausi, Chimbo, Guaranda, Riobamba, Guano, Colta, Ambato, Pelileo, Patate, Pillaro, San Miguel, Satacunga, Machachi, Chillo, Quito, Cotocollas, Pomasqui, Puembo, Tumbaco, Otavalo, and Ybarra.

There are about 100 kilometers of railroad constructed up to date in this line, the most important of all.

Between Chimbo and Sibambe the greatest difficulty is encountered in constructing the railroad of the south; because there must be passed over a great part of the western chain of the Andes, and the road must climb up to an elevation of 3,000 meters in a distance of about 50 kilometers; for which it has been necessary to attain a grade of 82, crossing over enormous precipices, rocks, and wide rivers. This accounts for the slowness in carrying on such a collossal work that rivals or exceeds, perhaps, the road built on the lands of Oroya in Peru.

In order to comprehend the magnitude of those obstacles, it is sufficient to state that the contract with Mr. Kelly was fixed at $145,000 per league, and this sum, although seemingly high, does not cover the expenses of construction, according to documents and publications I have among my papers.

On the 9th, of April, 1884, the Ecuadorian Congress made a law authorizing the executive power to appropriate $300,000 for the construction of a railroad of Manabi, a province of the Pacific coast, and in August, 1887, a contract was made with Mr. Ignacia Palao to construct said line, which to-day is being built, with strong subsidies which the Government gives, and a loan obtained from European capitalists. This road commences from the bay of Caraquez, and crosses a region of exhuberant fertility, and has but little obstacles along the proposed route. The length of the road will be 400 kilometers, more or less, and connects the rich and industrious province of Manibi with the capital of the Republic.

The province of Rios, Guayas, and Esmeraldas are washed by a net-

work of large and small rivers, the greater part of them navigable; and their valuable products are carried by a large number of steamers that ascend these rivers to points that seem almost inaccessible. The laws of the country that open up the country and give facilities have served as a stimulus for various companies; and these, due to keen competition, have so lowered the rates on freight and passengers as to come within reach of all; thus giving an accommodating, quick, and cheap service. Notwithstanding this condition of affairs, a contract was awarded to Mr. Joseph Theakston to build railroads in the province of Rios in order to give a greater facility of communications, and for the transportation of fruits, among them being that of cacao, which in this province alone amounts to some millions annually.

In March, 1884, another concession was given to Mr. Antonio Meina to build a railroad between the cities of Machala and Cuenca, and which is about 180 kilometers in length. To-day, this contract is in the hands of the family of Mr. Juan B. Dávilla, whose heirs are endeavoring to arrange amicably the difficulties that had arisen, due to the recent demise of the contractor. This line shall pass through Azogues and join the three provinces of Ora, Canar, and Azuay In May of the same year, a concession was also made to Messrs. Muñoz and Wilczynska for the construction of another line between Santa Rosa and Zaruma, districts in the province of Oro. The length of this road is only 40 kilometers, but it runs through the rich mineral districts of Zaruma whose ore is of high fineness, and employs the work of a multitude of mining enterprises that are constantly being established with native and foreign capital, under the sanction of the most liberal mining laws, that I had the satisfaction to approve in August, 1886.

About the middle of the year 1887 a contract was made with Mr. Marcus J. Kelly to establish a railroad between Duran and Yaguachi. It is about 22 kilometers long. It is finished and in running operation, costing $650,000.

In the same year Mr. Francisco Wyte Wiswell made a contract to build a railroad between Ybarra and Pailon, in the province of Esmeraldas. This road is from 110 to 125 kilometers long; and if it should be built, or better, I should say, when it is built, will give an outlet for the valuable products of the provinces of Ymbabura and Carchi that are situated on the boundaries of Colombia.

As a counterbalance to the material obstacles that the accidents of the land in Ecuador present for the construction of railroads, we have, on the other hand, the advantages that our forests abound in indestructable woods for railroad ties and other things; that the narrow-gauge system is adopted, and that in our contracts we cede lands of the first quality and large area, and that our laws accord protection and privi leges of positive importance.

The present epoch of peace that the country enjoys, the path of progress that its able ruler follows, and the foreign credit which undoubt-

edly shall remain solidified by the legislature, which for that object is going to assemble, leads us to hope with foundation that the public works initiated by the preceding administration will be carried out and new ones inaugurated in accordance with the demands of the present century, in which the prosperity of the people spreads itself on wings of electricity and carries forward its march by means of railroads.

Your obedient servant and friend,

J. M. P. CAAMANO.

Hon. Mr. J. F. VELARDE.

THE RAILWAYS OF GUATEMALA.

REPORT OF FERNANDO CRUZ, DELEGATE FROM GUATEMALA.

MEMORANDUM OF RAILROADS IN THE REPUBLIC OF GUATEMALA.

There are only two lines constructed and in actual operation in Guatemala: that which starts from the capital and terminates at the port of San José, and that which connects the city of Retalhuleu with the port of Champerico. The first is 70 miles long, and is owned by a North American syndicate. Negotiations are now pending looking to its purchase by the Government. The extent of the second is 27 miles; it belongs to Guatemalan capitalists.

Some time since a contract was made for a branch line, which, starting from Old Guatemala, would unite with the aforementioned lines. The company commenced the work, but it is now paralyzed.

The greatest work which the Republic has in view is the construction of the Northern Railroad, which will begin at the capital and end at the Bay of Santo Tomas on the Atlantic, crossing through extensive territories, fertile and rich in natural products, and providing the important cities and agricultural centers of the country with a natural road, short and cheap, for the commerce of Europe and the United States. This line, connecting with that from Guatemala to San José, will constitute a great interoceanic road. Its total cost is calculated at from $8,000,000 to $9,000,000. The Government has already contracted with a French syndicate for its construction, but it is not yet known if this syndicate can carry out its agreements.

The Northern Railway constructed, its most important branches will be to Santa Ana, in the Republic of Salvador, furnishing an outlet by the Atlantic for the fruits which that country produces; to Mazatenango or Retalhuleu, in the western district, to connect the most valuable agricultural belts of the Republic with the interoceanic line; to Coban, on the northern coast, an important coffee center; and to the capitals of the eastern districts.

Other important lines would be those which should connect the Port of Ocos with the agricultural centers of Costa Grande, and Cuca, of Tumbador, and of San Marcos in the western districts.

We might connect with Mexico by means of a railroad run by way of the Pacific coast to the frontier of both Republics. One which should

be built crossing the extensive and sterile district of Peten would be enormously expensive and of difficult execution.

A line which should connect us with the Republic of Honduras, besides being unprofitable, would be difficult and costly.

The other railroads which the country needs for its development are of less importance than those here indicated.

FERNANDO CRUZ.

THE RAILWAYS OF HONDURAS.

*REPORT OF JERONIMO ZELAYA, DELEGATE FROM HONDURAS.**

WASHINGTON, D. C., *January* 12, 1890.

ESTEEMED COLLEAGUE: It gives me pleasure to reply to your polite request by furnishing you with information relative to Honduras desired by the Railroad Committee, of which you are chairman.

Honduras is situated between the thirteenth and sixteenth parallels of north latitude, having 250 miles of coast on the Atlantic, and 60 on the Pacific, with magnificent harbors on both oceans. Being favored with peculiar advantages for the construction of an interoceanic railroad, gifted with a healthy climate, and possessing varied and abundant natural resources, it finds itself in circumstances exceptionally favorable for establishing with all the countries of America, and even with the whole world, a commerce of the greatest importance.

Honduras is truly rich in useful and precious metals, in extensive and fertile farming lands, in lumber for building and cabinet work, and in textile and medicinal plants.

The government of Honduras, being convinced that the best means for developing the country would be to traverse it by an interoceanic railroad, attempted its construction as much as thirty years ago. Not being able to organize a company in this country, it at length contracted in England a debt of $5,000,000 for the execution of a third part of the work, mortgaging the road itself and the government lands. In October, 1868, the work was formally commenced at Puerto Cortez; but scarcely had 50 miles of the road been laid, at a probable cost of a million and a half at the most, when Honduras, the victim of wretched management, found herself defrauded of the remaining millions, and indebted without the power of prosecuting the work. Since then other endeavors have been made to arrange the debt in England, and secure the continuance of the railroad, but these efforts have been of little avail, and at the present date Honduras possesses only her hopes for the future and 38 miles of railroad in actual operation, since the remaining 12 miles became useless, owing to the destruction of an iron bridge over the Chamelicon River, and to-day sleepers and rails lie buried beneath the grass.

The interoceanic railroad projected between the Bay of Honduras, on the Atlantic, and the Bay of Fonseca, on the Pacific, will be 200 miles

* Translation.

long, and have, at the center, a maximum elevation of 2,850 feet, or a grade of 29 feet to the mile, rather less than 1 in a 100. This favorable circumstance is due to a break at this point in the Cordillera of the Andes, and to the fact that a chain of rich and fertile valleys extends from north to south, thus materially facilitating the performance of the work, and insuring the success of the enterprise.

The road is to-day in the hands of Mr. Kraft, of Puerto Cortez, who leased it from the goverment for thirty years, five of which have already passed. This gentleman keeps the existing lines in operation, and obtains from the traffic between Puerto Cortez and San Pedro Sula a monthly return of about $1,250. In case of the organization of a company to continue the road, Mr. Kraft will offer no objections.

The diagrams, profiles, and other details relating to the road will be found explained in the work of G. S. Squier, entitled "Notes on Central America," and may perhaps be found also in the archives of the State Department.

Another railroad from Puerto Cortez to Truxillo, 150 miles in length and parallel to the Atlantic coast, has been commenced on account of its obviously great importance to the development of the country. The principal objects of this road are the exploitation of valuable woods and the advancement of agricultural industry in the northern part of Honduras. For the construction of this road the government has made a liberal concession to Mr. S. B. McConnico, general agent in New Orleans, of the Illinois Central. It is to be hoped that the concessionary will avail himself of this grant, and construct the road within the time specified.

There is also a railroad projected, but not yet commenced, which is to unite the port of San Lorenzo, in Fonseca Bay, with Tegucigalpa, the capital and commercial and mining center of the Republic. This line will be over 100 miles in length, and, compared with those heretofore described, will be relatively costly. The annual imports and exports of Honduras are as follows:

IMPORTS.

	Packages.
For the the Pacific, Port of Amapala (7,389,707 pounds)	59,192
For the Atlantic:	
Port of Cortez	31,899
Roatan y Ulila (7,347,745 pounds)	16,580
Trujillo	23,168
Total	71,647

EXPORTS.

For the Pacific	$1,805,378.33
For the Atlantic	1,271,114.88
Total	3,076,493.21

Of which $1,500,000 are exported to the United States in silver and gold, and $1,000,000 in fruits, lumber, India rubber, and sarsaparilla.

The maritime movement of the ports is as follows: In service on the Pacific, 11 steamers and 12 sailing vessels; on the Atlantic, 34 steamers and 44 sailing vessels.

Which figures, relating to the past fiscal year, clearly show that during the construction of the railroads above mentioned, and especially of the interoceanic one, a large traffic between the ports and the interior of the country would be developed, proportionate to the immense natural wealth of the country, which is at present lying undeveloped.

Moreover, it should be taken into consideration that once interoceanic communication is established across Honduras it would serve for general transportation, competing successfully with Panama, especially with places north of the equator, such as San Francisco and New Orleans, or New York and San Francisco.

Appended will be found a map of Honduras, which, although imperfect in detail, is sufficiently correct as a whole. There is not yet a complete map of the country drawn with scientific precision; but, having taken the limits of the coast from the United States hydrographic charts, and the border lines of the adjoining Republics, which have been well laid down, the details were filled in by means of observations made by experienced travelers.

With expressions of sincere esteem, I am, your obedient,

JERONIMO ZELAYA.

Hon. J. F. VELARDE,

Delegate from Bolivia, and Chairman Committee on Railroads.

THE RAILWAYS OF MEXICO.

The Mexican system of railroads since the completion of a line from Vera Cruz to the City of Mexico, with a branch to the city of Puebla, has been greatly developed. The country is now pretty well intersected by railways, and their construction is being rapidly pushed forward. In a short time Mexico will possess a net-work of railroads that must materially develop her vast natural wealth.

In 1879, there were only 372 miles of railway. From 1880 to 1884 the construction of new lines may be said to have been rather too rapid. In 1883 the number of miles existing was a little over 2,800.

In 1886 there were in operation about 3,725 miles of railroads.

In 1887 there were open for traffic 3,870 miles besides 92 miles of city or suburban lines, altogether 3,962 miles.

The Mexican minister, Señor Don Matias Romero, in a letter on the railroads of his country, dated April 30, 1890, says:

The only data which I can give you on the subject is the inclosed list, showing the number of kilometers of each line constructed. The President in his address to the Congress on the 1st instant, stated that Mexico has 8,850 kilometers of railroads.

All of the railway lines are subsidized, excepting the International Railroad.

List of railroads in Mexico.

	Kilometers.
Mexican Central Railroad (broad gauge):	
Mexico to Paso del Norte	1,970
Tampico to San Luis	442
Silao to Guanajuato	23
Soledad to San Luis	6
San Luis to Guaristemba	25
Aguas Calientes to San Luis	210
Irapuato to Guadalajara	260
Marques to Zimapan	24
	2,960
Mexican National Railroad (narrow gauge):	
Mexico City to Laredo	1,351
Acambaro to Morelaia	92
Morelia to Patzcuaro	62
Mexico City to El Salto	67
Manzanillo to Armeria	45
Zacatecas to Ojo Caliente	47
Matamoros to San Miguel	20
	1,684
International Railroad, from Torreon to Piedras Negras (broad gauge)	617
Mexican Railroad, Mexico City to Vera Cruz, and branches to Puebla and Jalapa, (broad gauge)	569
Intercolonial Railroad (narrow gauge)	623
Tehuantepec Railroad	108

Hidalgo Railroad	157
Guaymas to Nogales	422
Sinaloa to Durango	62
Salamanca to Valle de Santiago	14
Cordova to Tuxtepec	37
Monterey al Golfo	256
Chihuahua to Parral	5
Potrero to Cedral	20
San Juan Bautista to Tamulta	3
Toluca to San Juan	12
Tlazcala to Santa Ana	8
Tlalmanalco Railroad	20
Tehuacan to Esperanza Railroad	50
Vera Cruz to Alavarado	71
Puebla to Izucar	46
Calkini to Campeche	67
Merida to Sotuta	54
Merida to Calkini	52
Merida to Progreso	26
Merida to Valladolid	80
Merida to Peto	75
Maravatio to Iguala	45
Tramways	584
Cardenas to Rio Grijalva	8
Orizaba to Igenio	5
Chalchicomula Railroad	10
Total	8,850

WASHINGTON, *April* 30, 1890.

REPORT OF SEÑOR GENERAL ENRIQUE A. MEXIA ON THE RAILROADS OF MEXICO.

To the President of the Committee on Railroad Communication:

SIR: The Mexican railroad system consists, to-day, of 8,850 kilometers completed and 2,793 kilometers in course of construction. Two interoceanic lines will shortly be finished, the interoceanic from Vera Cruz to Acapulco, and the Tehuantepec from Coatzacoalcos in the Gulf of Mexico to the Pacific Ocean. The latter line will be completely finished before the end of three months. The lines that can serve for the Continental International Railroad are two: the Mexican International and Mexican Central. The former could be employed for traffic from all points between the Atlantic coast and the Rocky Mountains, and the latter for the traffic between the said mountains and the Pacific coast. These two lines unite in the Torreon, and come on only one line, the Mexican Central, to the city of Mexico.

From the capital of Mexico the route along the Vera Cruz Railroad would be taken to a point called Esperanza and from there to Tehuacan, which is the terminus of the constructed lines; and from thence the route would be taken that is in course of construction toward Oaxaca, Tehuantepec, and the Republic of Guatemala.

E. A. MEXIA.

WASHINGTON, *April* 15, 1890.

THE RAILROADS OF NICARAGUA.

MEMORANDUM CONCERNING THE RAILROADS IN NICARAGUA.

There are at present in operation in Nicaragua about one hundred miles of railroad.

The line is divided into two sections, which are called the Eastern and Western. They are separated by Lake Managua, the 24 miles of width of which are crossed by commodious steamers.

The Western section, which was the first constructed, starts from the port of Corinto, on the Pacific, and terminates at Lake Managua, as above stated. On this line, which is 57½ miles in length, is a great bridge over the estuary or inlet of Paso Caballos, which is a notable piece of engineering.

The Eastern section of the railroad goes from Managua, the capital of Nicaragua, to Grenada, a city situated on the great Lake Nicaragua. As this city is in direct and constant communication, by means of the the lake and the San Juan River, with the port of San Juan del Norte, or Greytown, on the Atlantic, it results that there exists across the territory of Nicaragua good and easy communication between the two oceans.

The Nicaragua railroad is on the American system, and was constructed exclusively with national capital, without aid from foreign funds. The road, as well as the rolling stock, is of the best quality. Although of small dimensions as yet, it is of the greatest utility to the country, for it brings in contact many of its principal commercial centers.

In Nicaragua there is noted a great interest in the development of railway enterprises, and it is certain that before long the number of miles in operation will have increased considerably.

As regards the connecting of the Nicaraguan railways with those which may be constructed in the neighboring republics, the work would present no difficult engineering feats as far as the topography of the country is concerned.

H. GUZMAN.

THE RAILWAYS OF PARAGUAY.

*REPORT OF JOSÉ S. DECOUD, DELEGATE FROM PARAGUAY.**

WASHINGTON, *January* 23, 1890.

DISTINGUISHED COLLEAGUE: In reply to your esteemed favor of the 7th instant, I have the honor to forward to you the information requested with respect to the railroads of Paraguay, together with a map of the Central Railroad and its connection with the Argentine system.

In the report of the engineers, Burrell and Valpy, which I beg leave to append, you will find all the information I can procure which would be suitable to your needs.

With expressions of my most distinguished consideration, I remain,

JOSÉ S. DECOUD.

Hon. Dr. JUAN FRANCISCO VELARDE,
Chairman of the Committee on Railroads, etc.

Report of Messrs. Burrel and Valpy, M. M. Inst., C. E. of the Paraguay Central Railway, together with estimate of the probable traffic that will be carried when line is completed through out.†

This railway consists of three portions:

	Miles.
(1) From the port of Asuncion, the capital of Paraguay, to Paraguari, in operation	46
(2) From Paraguari to Villa Rica, in operation	46
(3) From Villa Rica to Villa Encarnacion, to be constructed	136
Total length of railway, about	228

The first section, from Asuncion to Paraguari, was originally made by the Government, and has been in operation many years. Although this portion of the railway has been worked under great disadvantages, especially as regards the inadequate supply of rolling-stock, its revenue has rapidly and continuously increased, as the returns below will show, taking 3*s.* as the average value of $1:

	Gross receipts.	Gross receipts per mile.
1883	£10,675	£237
1884	13,267	294
1885	13,954	310
1886	19,033	423
1887	24,103	536

* Translation. † Original.

The working expenses have been reduced from about 70 per cent. in 1884 (they are not comparable for 1885 to about 60 per cent. in 1887; the net revenues have consequently more than doubled in this period.

It may confidently be expected that the results of the working of 1888, when known, will bear a favorable comparison with those of 1887, and as the new rolling-stock manufactured by Messrs. Krupp & Co. for the Government has recently been delivered in Asuncion, whilst in July, 1887, Congress voted the sum of $150,000 for improvements on this section, there can be no doubt that the future returns of this portion of the railway will *per se* greatly exceed those obtained in the past.

The second section, from Paraguari to Villa Rica, is already constructed and equipped with the above-mentioned rolling-stock; opened for traffic since January, 1890.

The first and second sections together form a length of about 92 miles, and will connect Villa Rica, the second largest town in the country, and the center of a very rich district, with Asuncion. We anticipate therefore a very considerable and more than proportionately increased traffic to accrue to the railway immediately on the opening of the second section, with a reduction in the rate of working expenses.

From the surveys we have made of the extension from Villa Rica to Villa Encarnacion, we find that the line will be of easy construction owing to the comparatively level ground through which the railway will pass.

The earth-work will be light, except near Villa Encarnacion, where somewhat heavier work will be encountered, and a careful and more detailed study of the ground will be required than we have yet had an opportunity of making in order to select the best line.

The rivers to be crossed are not rapid and are of little depth, and all the bridge-work can be constructed with native timber, which is of a very suitable character.

The gradients will be comparatively light and the curves easy on this section, as well as from Asuncion to Villa Rica, so that the working expenses of the railway may fairly be expected to be low.

The railway, when completed, will run through and open up some of the most fertile and populous portions of the country. It will terminate at the town of Villa Encarnacion, on the river Parana, opposite to the town of Posadas, the terminus of the Argentine Northeastern Railway, now under construction and, we understand, being pushed forward rapidly.

These railways, when completed, will form the future trunk line of the country, affording as they will do the shortest route to the seacoast, with important intermediate connections, firstly via Brazil to Rio Grande do Sul, secondly via Uruguay to Monte Video, and thirdly via the Argentine Confederation to Concordia, or if certain projected railways are constructed to Buenos Ayres itself.

The line from Villa Rica to Encarnacion, passing as it does through

a fertile country, will secure a considerable traffic, which will in addition largely increase the traffic on the line from Villa Rica to Asuncion The through, or international, traffic may also be expected to be large and to arise immediately on the completion of the railway.

On a moderate basis we estimate that when the railway is opened throughout the gross traffic will amount, on the average, to £1,000 per mile per annum, or a total of £228,000, and judging by comparison of other South American railways, a traffic of this amount should be worked at 50 per cent., giving a net revenue of £114,000 per annum.

A considerable proportion of the country through which the railway passes consists of forest lands, comprising timber of valuable description for house building, ship building, railway sleepers, etc., and it is expected that a large traffic will be derived from the carriage of timber from the ports at both ends of the line. The carriage of yerba maté and agricultural produce—*e. g.*, tobacco, grain, oranges, etc.—should also yield a substantial income, whilst large numbers of horses and cattle are constantly being brought from the province of Corrientes to Encarnacion, which should further add to the receipts.

THE RAILWAYS OF PERU.

*REPORT OF F. C. C. ZEGARRA, DELEGATE FROM PERU.**

LEGATION OF PERU
IN THE UNITED STATES OF AMERICA,
Washington, January, 1890.

SIR: I have the honor to present to you the report solicited by the committee of which you are the worthy chairman.

Appended to said report you will find a map of the Republic and a printed volume.

I have the honor to be, your very obedient servant,

F. C. C. ZEGARRA.

Hon. JUAN FRANCISCO VELARDE,
Chairman of the Committee on Railroad Communication.

DATA FURNISHED BY THE PERUVIAN DELEGATION TO THE COMMITTEE ON RAILROAD COMMUNICATION.*

No. 1.—*Map of the Republic.*

The Delegation has the honor to inclose a map which bears no title, but which, it believes, was copied from a work entitled: "Geographical Atlas of Peru," by Dr. Don Mariano Felipe Paz-Soldan, and although it is to be hoped that in its draughting other previous maps have been consulted, the Delegation does not consider itself authorized to guarantee its relative exactness. For this reason it deems it indispensable that other works should be consulted, and especially one entitled "El Peru," written by the naturalist Don Antonio Raymondi, which contains abundant and important data relative to explorations, configuration of the land, physical conditions, and other details necessary to obtain an idea of Peru.

The delegation regrets not having at hand the said work, which might possibly be found in one of the many public libraries of Washington.

* Translation.

No. 2.—*Railroad lines constructed and in operation, lines in course of construction, and lines projected, and lines which connect the neighboring nations.*

The names of the lines, their length, and other details will be found in the accompanying collection of decrees and contracts. The lines actually in operation are the following:

	Kilometers.
Callao to Chicla	146
Callao to Lima and Chorrillos	27
Lima to Ancon	
Lima to Magdalena	6
Pisco to Yca	74
Chimbote to Huaraz	70
Payta to Piura and Catacaos	
Salaverry to Trujillo	7
Pacasmayo to Yonan and Guadalupe	146
Mollendo to Arequipa	173
Arequipa to Puno	370
Juliaca to Santa Rosa	193
Mineral del Cerro de Pasco	11

The projected lines consist principally of the prolongation towards the interior of the country of some of the existing lines already mentioned. No line exists connecting Peru with the neighboring nations, but an effort has been made to prolong the Puno line to Desaguadero in order to unite it with the railroad system projected in Bolivia.

No. 3.—*Cost of work done and projected.*

The cost of the work done will be found, for the most part, in the accompanying volume. No estimate has been made of the projected work, because the Government is not responsible for its payment, but the syndicate of foreign stockholders under the clause of the last contract concluded in Lima, and it has not been considered necessary to specify in detail the value of work not yet commenced.

No. 4.—*Annual returns, traffic, and prospects.*

The returns from the lines actually in operation have only been satisfactory in the case of those completed, such as Lima to Callao and Chorrillos, Lima to Chicla, and Mollendo to Puno. The others, in order to give any advantageous results, without doubt need to be extended to their natural termini. This attained the interior development of the country will make a great and rapid advance; the fountains of wealth existing in the Republic will be opened and what to-day remains inert for lack of cheap and regular outlet to the sea-coast will be developed. With this in view it is of the greatest interest for Peru to have railroad lines running either to the Atlantic or to the Pacific Ocean and it is evident that enterprises of this kind will be of incalculable utility.

No. 5.—*Facilities which the Government has offered for this class of work.*

It may be judged to what extent the Government of Peru is, on its part, inclined to facilitate the construction of railroad lines through its territory when the offers it has already made are borne in mind.

Not long since it invited proposals for the construction of a railroad from Limo to Pisco, offering the following perquisites:

(1) Exemption of customs duties, during twenty years, on the material, fixed and rolling stock destined for the plant of the line;

(2) Authority of the Government to adjudicate to the manager 25,000 hectares of vacant lands near the line, with the express condition that they shall be irrigated within five years;

(3) Exemption from military service in the army, during time of peace, for the employés and laborers on the railroad;

(4) Privilege of operating the road for twenty-five years; and

(5) The power to transfer the property of the line and its branches.

In the contracts concluded lately with the foreign bondholders, whilst the power to operate the railroads constructed is given them, there is imposed upon them the obligation to extend these, and there is ceded to them:

(1) All the disposable government lands necessary for the railroad lines, stations, depots, factories, and other dependencies without remuneration whatever.

(2) Exemption from government taxes during the period fixed for the construction and possession of the railroads; and during the period of the enjoyment of the benefits derived therefrom, exemption from taxes on locomotives, rolling stock, rails, sleepers, and anthracite coal.

(3) The right to navigate freely the interior lakes under the Peruvian flag.

THE RAILWAYS OF SALVADOR.

*REPORT OF JACINTO CASTELLANOS.**

WASHINGTON, D. C., *January* 9, 1890.

MY DEAR SIR AND DISTINGUISHED COLLEAGUE:

Replying to your favor of the 7th instant, which I had not received until to-day, I am sorry to inform you that I lack the documents necessary to give you information with respect to the plans and computations which may have been presented in Salvador for newly projected railroads; and that the only data that is possible for me to give you touching their actual state and the possibility of connecting them with the lines of the neighboring Republics of Guatemala and Honduras is as follows:

A tramway 10½ miles in length unites the cities of San Salvador and Santa Tecla.

A steam railway connects the port of Acajutla with the city of Sonsonate, the distance being 21½ miles.

From that city the same line is extended to the interior of the Republic to a point called Amate Marin, over a distance of 80¾ miles.

Work is now progressing on the railroad from Amate Marin to the capital of the Republic, and once concluded, it will have an approximate extent of 25 miles.

There are two other lines of railways now projected, one to connect the rich city of Santa Ana with the port of Acajutla, joining it at the station of Armenia, between Sonsonate and San Salvador, and the other from the port of La Union to the city of San Miguel. For the building of the latter, a company is now being organized in London, and for the former there have been subscribed by the capitalists of the country about $300,000.

I do not consider the union of the Salvador railroads with those of Guatemala and Honduras to be difficult, if these two republics carry their roads to the frontier; for at any point thereon they could be joined to the existing roads.

It is in the latter lines, to my mind, that the principal difficulties exist, because of the great extent of their territories.

I am, sir, with every consideration, your very humble servant,

JACINTO CASTELLANOS.

Mr JUAN F. VELARDE,

Delegate for Bolivia to the International American Conference.

* Translation.

THE RAILWAYS OF THE UNITED STATES.

*REPORT OF HENRY G. DAVIS AND ANDREW CARNEGIE, DELEGATES FROM THE UNITED STATES, TO THE COMMITTEE ON RAILWAY COMMUNICATION OF THE INTERNATIONAL AMERICAN CONFERENCE.**

WASHINGTON, D. C.,
March 24, 1890.

The attention of the people of the United States has been for years directed to the desirability of securing closer commercial relations with the states of Central and South America.

For want of regular, quick, and economical transportation between these countries, trade is carried on almost wholly by way of Europe; mail matter, passengers, and goods are compelled to cross the Atlantic twice before reaching their destination. Although united geographically, close commercial relations do not exist; neighbors though we are, yet for want of prompt and regular transportation facilities we are widely separated.

That the trade with these countries is extensive is shown by the table on page 74. Spanish America has an area of 8,500,000 square miles, with about 50,000,000 inhabitants; of this area a large part is undeveloped, although immensely rich in mineral and agricultural resources, and yet the present trade amounts to about $900,000,000 yearly, about equally divided between imports and exports; of this trade in 1889, $173,217,571, or one-fifth only, was with the United States, $122,014,137 being imports and $51,203,434 exports. In other words, we buy from the Spanish American countries more than twice as much as we sell them. This should not, and need not, be.

In 1887 Great Britain's trade with these countries amounted to about $176,208,000, of which $71,283,000 were imports and $104,925,000 exports, or, in other words, Great Britain sells almost twice as much as it buys from them.

The United States exported to Great Britain in 1889, $382,981,674, and imported from that country $178,269,067, less than one-half the exports. Why should our trade with Great Britain be so much in our favor, and that with Spanish-American countries the reverse, and Great Britain's trade with these countries be so much more favorable to it than our trade with them is to us?

We manufacture most of the articles used by them as cheaply as Great Britain, and many of these manufactured in the United States are shipped

* Original.

to Europe and then to Spanish America. Central and South America have raw material which we need, and it may be said that the resources of these countries are almost undeveloped. There is a great field which if opened up to us must be immensely valuable.

With quick and regular communication which Europe has enjoyed and we have not, she has more than successfully competed with us for the trade of these countries; but if rail communication were opened from the United States southward such would not be the case, as we should then have the advantage of connection by land which Europe could not obtain. This is proved by an examination of the effect of rail communication between the United States, Canada, and Mexico.

The opening of direct rail communication between the United States and the city of Mexico took place in April, 1884. From that day it began to be felt that all influences and all other modes of communication combined could not exert so powerful an effect in drawing these countries together and extending their trade. Special attention is called to the growth of traffic between the two republics since united by rail.

From tables, pages 77, it is seen that whereas the traffic carried in cars or other land vehicles amounted to $2,164,414 in the year 1883, it reached $13,955,764 in 1889, increasing sixfold in six years. Nor has this remarkable increase been made by diverting trade from other land routes or from water transportation lines, for the total imports and exports between the United States and Mexico (table 29, page 76) shows rapid and continuous development, the total of 1883 being $24,764,000, and that of 1889, $32,740,000.

The influence of rail communication upon trade between the United States and British North American possessions is not less marked.

In 1853 a railway was opened between Portland, Me. and Montreal. The year previous, 1852, shows imports into the United States from British North America, $5,469,000. These reached $43,000,000 in 1889. The exports from the United States in 1852 were only $13,993,000. In 1889 they reached $57,412,000. It is to the railroads we owe the revolution which has taken place in the trade of these British possessions.

In 1887 Canada exported to Great Britain $44,571,846 and imported $45,167,040, and in the same year exported to the United States $37,660,190 and imported $51,006,323, the total to and from Great Britain being $89,738,886, and the United States $88,666,513.

In 1889 this was reversed. The United States now ranks first; the proportion of Great Britain's trade to and from being 44.44 per cent. of the whole, that of the United States 47.20, so decided is the effect of frequent and rapid intercommunication by rail over the slower and irregular mode by water. It is a significant fact that almost all the trade between these countries is transported by rail. Not one regular line of steam-ships plies between the United States and Canadian ports. These exhibits prove that the experience of the United States with railways within her own border is being repeated with lines in Canada and

Mexico, and, no doubt, would be repeated upon international lines as these are constructed, and bind together the republics of America in their peaceful grasp.

THE UNITED STATES RAILWAY SYSTEM.

As far as the people of the United States are concerned, it unnecessary for us to dwell upon the importance of our railway system, for no words of ours can adequately describe their universal appreciation of the value of rapid railroad communication between all parts of the Republic. Not only are railways considered by them the first factor in our material development, but it is clearly seen that these alone have rendered development possible; nor is this their most valuable service to the nation; for, unbound by these ribs of steel, the question of the future of the union between the States might give rise to serious foreboding, bound together as they are into one vast neighborhood the people of the various States, by frequent change of residence, intermarriage, commercial relations, and constant communication, are fast becoming more and more of one national type, alike in thought, manner, and action.

It may be well, however, for the benefit of those among our neighboring republics who have not yet fully entered upon the construction of railways to give a short history of our railway policy and its results. For this purpose we have availed ourselves freely of the services of Messrs. Taylor and Brock, the respective heads of the Railway Bureau and of the Bureau of Statistics.

The United States possesses to-day nearly half the railway mileage of the world. At the close of the year 1889 there were 161,313 miles in operation, enough to make twelve steel girdles around the earth. Their cost has been fully *eight thousand millions of dollars*. Excepting agriculture, the railway interest is the largest single interest in the country. It employs as wage-earners not less than two millions of people; thus eight millions or more persons depend upon railways for their daily support. The development and prosperity of the country have been proportionate to the building of its railways. In the increase of population, business, and wealth, in the opening to settlement and commerce of new States and Territories, the railway has been the most potent factor. It touches every pursuit, whether of agriculture, manufactures, finance, commerce, or science. It is comparatively a short time since the settlement of the country bordering on the Mississippi River began. Prior to that, and before the era of railway building, settlements were few and small upon the shores of the lakes and the navigable rivers that then furnished means of transportation for the surplus products of the factory and farm.

As fast as railways were constructed the adjacent country was rapidly settled. Wherever a railway reached, supplying the necessary facilities of transportation, there hurried with eager steps labor and capital, seeking employment and investment. Forests were felled and

mines opened and contributed their wealth to the markets of the world. Vast prairies, inhabited only by Indians and wild beasts, where the yearly vegetation rotted upon the deepening soil, when traversed by railways quickly sprang into active agricultural and commercial life. The touch of the plowshare brought abundant harvests, and villages and cities sprang into existence.

To show the great importance of railways to the agricultural interests of the United States, Poor's Manual for 1889 says:

Over ordinary earth roads wheat will bear transportation for a distance of only 250 miles, when its value is $1.50 per bushel at the market. Indian corn will bear transportation only 125 miles, when its value is 75 cents per bushel. When grown at greater distances from market, these products, without railroads, have no commercial or exportable value. The railroads by transporting at one-twentieth the cost over earth roads give a marketable value to wheat grown 5,000 miles inland; to Indian corn grown 2,500 miles inland. Beyond a certain limit, consequently, these works are the sole inducement to the production of these staples in an amount greater than that necessary for consumption by the producer. Railroads are as much the condition of their production as the ship is for the production of wool in Australia. The effect of cheap production is well illustrated in the extraordinary increase in the production of wheat and corn in the Western States and the corresponding impulse given to the construction of railroads, the increased mileage of which has only kept pace with that of other industries.

It is not, however, as potent agencies, foremost in stimulating the settlement and development of the resources of the country, that railways perform their highest function, but, as has been before stated, they cement and tend to preserve the unity of the extended region over which the Republic holds sway. The building of the first Pacific railway was equally a military and a commercial necessity. Previous to the opening of rail communication, the Pacific coast had little in common with the Union. No sooner had the iron bands joined the agricultural regions of the Mississippi Valley and the manufacturing States of the East with it, than close business, social, and political relations sprang up between the two sections and bound them closely together. The intimate social, political, and commercial relations which now so happily exist between all parts of our united country could never have been created without rail communication.

The progress made in railway building in this country has been due largely to the liberality shown by local communities, the several States and the General Government toward railway enterprise. The Government has been prodigal in the bestowal of munificent grants of the public domain to aid the construction of railways, and in this regard has been wisely emulated by many of the States, which have given large tracts of their public lands to encourage the building of railways within their limits. In addition to large and numerous subsidies given by the General Government and the States to railway companies many counties, towns, villages, and cities have voted sums in aid of railway construction. Communities that had no railway have eagerly pledged their credit to secure one, and those that have had one or more have often made liberal donations to secure competing lines.

There is no room to doubt that this policy was wise. The value of every acre of land and every dollar in money contributed towardthe construction of railways has been repaid tenfold to the public in the added stimulus to business and increased value to property produced by cheaper transportation. Especially has this been true as regards the States and Territories of the West. There lay a region embracing more than half the area of the United States rich in natural resources, yet inaccessible, and heretofore practically valueless. Railways alone could have made this latent wealth productive. So with our mineral wealth. Had not railways stimulated by public aid been constructed through the mineral regions of the country our mines must have remained unopened.

Railway construction once begun in a country can stop only when all sections are supplied, for such are the advantages of railways to the sections that construct them that all other sections must necessarily follow or become almost valueless. For this reason we find every part of our country either already supplied with railways or rapidly becoming so.

Railway management is constantly growing more broad, conservative, and liberal; excessive rates and unwarranted discrimination are being corrected by competition and forbidden by law. Rates by rail are now not infrequently as low as by water, a condition of things which, a few years ago, was not thought possible. Reference to the following tables will show the great reductions in rates by rail which have taken place in recent years. It is believed that the minimum charges have not yet been reached.

FREIGHT RATES.

Annual average freight rates per bushel of wheat for transportation from Chicago to New York for each year from 1857 *to* 1888, *inclusive.*

Calendar year.	Average rates per bushel.		By all rail.	Calendar year.	Average rates per bushel.		By all rail.
	By lake and canal.*	By lake and rail.			By lake and canal.*	By lake and rail.	
	Cents.	*Cents.*	*Cents.*		*Cents.*	*Cents.*	*Cents.*
1857	25.29	.....	.....	1874	14.10	16.9	28.7
1858	16.28	.....	.....	1875	11.43	14.6	24.1
1859	17.59	.....	.....	1876	9.58	11.8	16.5
1860	24.83	.....	.....	1877	11.24	15.8	20.3
1861	26.55	.....	.....	1878	9.15	11.4	17.7
1862	26.33	.....	.....	1879	11.60	13.3	17.3
1863	22.91	.....	.....	1880	12.27	15.7	19.9
1864	28.36	.....	.....	1881	8.19	10.4	14.4
1865	26.62	.....	.....	1882	7.89	10.9	14.6
1866	29.61	.....	.....	1883	8.37	11.5	16.5
1867	22.36	.....	.....	1884	6.31	9.95	13.125
1868	22.79	22.0	42.6	1885	5.87	9.02	14.00
1869	25.12	25.0	35.1	1886	8.71	12.00	16.50
1870	17.10	22.0	33.3	1887	8.51	12.00	†16.33
1871	20.24	25.0	31.0	1888	5.93	11.00	†14.50
1872	24.47	28.0	33.5	1889	6.89	‡8.70	15.00
1873	19.19	26.9	33.2				

*Including canal tolls until 1882, but not Buffalo transfer charges.

†Averages of officially published tariffs. The actual cost of transportation was somewhat less, as rates were unsettled during a considerable portion of each year, and grain was frequently taken at less than tariff rates.

‡Average of officially published tariffs.

Annual average freight rates on grain and flour from St. Louis to various points during each year from 1876 to 1888, *inclusive.*

[Prepared by Mr. George H. Morgan, secretary Merchants' Exchange, St. Louis, Mo.]

Calendar year.	To New Orleans by river.		To New York by rail.		To Liverpool.	
	Grain in sacks, per 100 pounds.	Wheat in bulk by barges, per bushel.	Grain per 100 pounds.	Flour per barrel.	Via New Orleans, wheat per bushel.	Via New York, wheat per bushel.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1876	.....	.....	39½	79	.....	.....
1877	21	8½	41	82	.....	.....
1878	17½	7½	38	76	.....	.....
1879	19	7½	32½	67	.....	.....
1880	19	8½	42	84	.....	.....
1881	20	6	32	64	.....	.....
1882	20	6 5/12	29½	59	22⅝	23¾
1883	17½	5½	33	66	19 7/12	27
1884	14	6⅝	26	52	14 7/12	21¼
1885	15	6½	22½	44½	15⅛	20⅝
1886	16	6½	29	58	16⅛	24
1887	18	6⅝	32½	64½	14⅝	24¼
1888	15	6⅛	*29½	59	15⅛	22 12/16
1889	17 83/100	5 9/16	†28½	58	17⅛	24 97/100

* These figures 29½ represent published rates. At times during the year the rate was cut to 20 cents, making the average rate on that basis, St. Louis to Liverpool via New York, as low as 17¼ cents per bushel.

† On all grain, except corn, on which the rate was 26 cents.

NOTE 1.—In the normal condition of freight rates, the rate to Boston would be 5 cents per 100 pounds higher than to New York, to Philadelphia 2 cents per 100 pounds lower than to New York, and to Baltimore 3 cents per 100 pounds lower than to New York; but sometimes rates by these cities are independent of local rail rates.

NOTE 2.—The rate on flour is always double the rate on grain per 100 pounds.

GRANTS TO RAILWAYS.

On March 2, 1827, Congress granted to the State of Illinois lands to aid in the construction of a canal "to connect the waters of Illinois and Lake Michigan." Six years later, in 1833, Congress authorized the above grant to be diverted, and a railway constructed with the proceeds of said lands. This was the first land grant ever made by the Government to aid in the construction of a railway.

The first important land-grand act passed was that of September 20, 1850: "An act granting the right of way and making a grant of land to the States of Illinois, Mississippi and Alabama, in aid of the construction of a railroad from Chicago to Mobile." This grant gave alternate sections of land (even numbered) for six sections in width on either side of the road and branches, making six sections, or 3,840 acres for every mile of road. In the case of this grant, as in the case of all those made subsequently, the law provided that the land within the limits of the grant not given to the railroad company, that is, every other section, should be doubled in price from $1.25 to $2.50 per acre. In this way, the Government received as much from the lands remaining within the limits of the grant, as it would have received from all the

lands had no grant been made. The building of railroads rendered the lands salable; whereas in most cases, if no railroads had been constructed, the lands would never have found purchasers, as they were of no value where facilities for the transportation of their product to market were not provided.

Under an act passed June 10, 1852, entitled "An act granting the right of way to the State of Missouri, and a portion of the public lands to aid in the construction of certain railroads in that State," the Hannibal and St. Joseph and the Missouri Pacific Railroads were built.

June 29, 1854, a grant was made to the Territory of Minnesota for the purpose of aiding the construction of a railroad from the southern line to the eastern line. In 1856 a series of grants was made to Iowa and other States, to be used only to aid in the construction of railroads, which were in form and substance similar to the Missouri grant of June 10, 1852.

From 1850 to 1860 a strong sentiment arose favorable to the construction of a railroad to the Pacific coast. Congress, on July 1, 1862, enacted a law entitled "An act to aid in the construction of a railroad and telegraph line from the Missouri River to the Pacific Ocean, and to secure to the Government the use of the same for postal, military, and other purposes." This was the charter of the Union Pacific Railroad Company, which conferred certain privileges and made grants to several other railroad companies then existing under State charters. It empowered the Union Pacific Railroad Company "to lay out, locate, construct, furnish, maintain, and enjoy a continuous railroad and telegraph, with the appurtenances, from a point on the one hundredth meridian of longitude west from Greenwich * * * to the western boundary of Nevada Territory," subject to the terms of the act.

At the western boundary of Nevada it was to meet and connect with the line of the Central Pacific Railroad of California, a corporation then existing under the laws of that State which, by this act, was authorized to construct a railroad and telegraph line from the Pacific coast at or near San Francisco or the navigable waters of the Sacramento River to the eastern boundary of the State of California, upon the same terms and conditions in all respects as were provided for the Union Pacific Railroad Company, and it was further provided that the Central Pacific Railroad Company of California, after completing its line to the eastern boundary of California, should continue constructing eastward until it should meet and connect with the Union Pacific, and the whole line of railroad from the Missouri River to the Pacific Ocean was completed.

Right of way was granted through the public lands to the extent of 200 feet in width on each side of the track, and a grant of land amounting to five (increased to ten by the act of 1864) alternate sections per mile on each side of the road. In addition to the lands granted to aid in the construction of the Pacific roads mentioned, the act also provided for a Government subsidy of bonds equal to $16,000 per mile for that por-

tion of the line between the Missouri River and the base of the Rocky Mountains; $48,000 per mile for a distance of 150 miles through the mountain range; $32,000 per mile for the distance intermediate between the Rocky and Sierra Nevada ranges, and $48,000 per mile for a distance of 150 miles through the latter range of mountains.

These bonds were in the nature of a loan of credit by the United States, and were at first made a first-mortgage lien on the whole line of railroad and telegraph and all its appurtenances, but by section 10 of the act of 1864 they were made a second mortgage or subordinate lien to bonds of the same tenor and amount which the respective companies were authorized to issue.

The United States issued bonds to the amount of $27,236,512, and gave 13,384,089 acres of land to the Union Pacific Railroad Company. It also issued bonds to the amount of $6,300,000, and gave lands amounting to 8,174,000 acres to the Kansas Pacific Railway Company. The Denver Pacific Railway and Telegraph Company also received 1,355,292 acres of land. On January 20, 1880, these roads were consolidated and formed the Union Pacific Railway Company. It will be seen, therefore, that the Union Pacific Railway Company has been loaned by the Government, in bonds, $33,536,512, and been given in lands, 22,913,381 acres. The Central Pacific Railroad Company of California received in bonds $5,885,120, and was granted 9,440,000 acres of land. The Western Pacific Railroad Company received bonds to the amount of $1,970,560 and its land grant amounted to 1,576,448 acres. June 23, 1870, the Central Pacific Railroad Company of California and the Western Pacific Railroad Company were consolidated under the name of the Central Pacific Railroad Company; this company has, therefore, been loaned in bonds, $27,885,680, and has been granted lands to the extent of 11,016,448 acres.

Previous to these grants the Government expended $440,000 in making preliminary surveys to determine the feasibility of building a line to the Pacific.

In addition to the Government aid rendered to the railroads mentioned, large grants of land have been bestowed upon other companies for the building of transcontinental and other railroads.

The lands given by Congress to aid railway construction aggregated 197,700,000 acres. Some of these grants have been forfeited and others reduced in various ways, but most of the lands have gone into the possession of the various companies. It is safe to say that these lands, after the building of the railways to which they were given had been completed, were worth, at a low estimate, from $3 to $5 per acre. In many cases where grants of timber lands were made, including tracts of pine, the value of the lands was greatly in excess of the figures given. Taking these figures as a safe basis, they show that Congress has donated for railroad purposes lands worth from $500,000,000 to $800,000,000.

Vast as is this sum, the statistics of the increase in the population, business, and wealth of the States and Territories in which these land-grant roads have been built prove that its bestowal was wise.

The policy pursued by the people toward railway development has always been of the most generous and helpful character. It is specially gratifying that vast as have been the grants and concessions by the National Government, States, and communities, yet the returns made by the railways to the national unity, growth, and well-being, have far exceeded the expectations of the most sanguine, and that the Government will not be called upon to lose one dollar of any of its pecuniary advances or upon any of its guaranties, all the assisted lines being amply able to meet such obligations from their own revenues.

RAILWAY CONSTRUCTION.

Sixty years ago there were but 23 miles of railroad in the United States. In the next thirty years about 30,000 miles were built. In the last thirty years over 130,000 miles have been built. The figures which we give below as to the railroad-building, as well as to the growth of the States named in population, products, and wealth, date from 1860, a period of thirty years. The first few years following 1860, it must be remembered, were the years of the civil war, when progress in railway-building, as well as in many other public and private enterprises, was greatly retarded or entirely suspended.

Railway mileage of the United States.

Year.	Built during the year.	Total operated at end of year.	Year.	Built during the year.	Total operated at end of year.
	Miles.	*Miles.*		*Miles.*	*Miles.*
1860	1,846	30,635	1885	2,930	128,309
1865	1,177	35,085	1886	8,100	136,419
1870	6,070	52,914	1887	12,872	149,281
1875	1,711	74,096	1888	7,001	156,082
1880	6,712	93,296	1889	5,231	161,313

To prove that the aid rendered railways was wisely bestowed, it is only necessary to consider the increase in population and wealth directly attributable to their construction. It must be borne in mind that most of the railways receiving public assistance could not have been constructed at all, or that their construction would at least have been long delayed, unless thus fostered. Many of these roads were constructed before the business of the sections they traverse appeared to require them.

The policy was to build through sparsely populated or altogether unsettled regions in the belief that railways would induce settlement and create business. This has proved to be the case. Settlements have rapidly followed the building of every railway. No matter how wild and unproductive the country through which it passed, sooner or later it developed remunerative traffic for itself.

The figures emphasize the facts more strongly than anything that can be said relating to the wonderful growth which has followed railway facilities. We have selected a few of the States and given figures showing the number of miles of railway built, and their increase in population, products, manufactures, and wealth since 1860. (See page 78.)

The reader will search the history of the world in vain for such a record of growth as these figures show, and which the railway system alone has rendered possible.

SUMMARY.

The following summary shows the mileage of road, equipment, stock, bonds, and other liabilities; also earnings and traffic statistics of all the railways in the United States for the year 1888:

	Miles.
Mileage of railways, 1888	156,082
Double track, sidings, etc	37,225
Total track	193,307
Locomotives	29,398
Cars:	
Passenger	21,425
Baggage, mail, etc	6,827
Freight	1,005,116
Capital stock	$4,438,411,342
Bonded debt	$4,624,035,023
Other liabilities	$544,040,944
Passengers carried	451,353,655
Tons of freight moved	589,398,317
Earnings:	
Passenger	$251,356,167
Freight	639,200,723
Miscellaneous	60,065,118
Total earnings	950,622,008

RAIL COMMUNICATION BETWEEN THE THREE AMERICAS.

Examination of the subject of continuous rail communication between South and Central America, Mexico, and the United States is most encouraging. Judged by what has already been accomplished, the task can not be deemed stupendous. In opening railways between the Atlantic and Pacific Oceans, the United States, Canada, and other countries have performed works of equal or greater magnitude than will probably be required to establish unbroken railway communication with all the Republics south of us.

The building of the Baltimore and Ohio and the Pennsylvania Railways over the Allegheny Mountains were greater undertakings than that of an intercontinental railway would be now.

The most difficult portions of a railway to South America will not exceed those of the Mexican Railway from Vera Cruz to the City of Mexico, or those of the Panama Railway across the Isthmus.

Much has already been accomplished in the different Spanish-American countries in building parts of the proposed through line, which, when combined, will reduce the entire work and distance almost one-half; so that not only can continuous railway communication with those countries be considered feasible, but also that it is on a fair way to be realized. The situation at present stands thus:

The railways of the United States, from all points east and west, connect with the railways of Mexico upon the border of the two countries at El Paso, 2,456 miles from New York, 1,286 miles from San Francisco, and 1,642 miles from Chicago; at Eagle Pass, 2,083 miles from New York, 1,819 from San Francisco, and 1,380 miles from Chicago; and at Laredo, 2,187 miles from New York and 1,316 miles from Chicago. Hence to the City of Mexico there are two rail routes: that from El Paso via the Mexican Central, 1,224 miles; that from Laredo via the Mexican National, 839 miles, making the distance from New York via El Paso 3,680 miles, from San Francisco 2,510 miles, and from New York via Laredo 3,026 miles. A line is in operation 183 miles south of the City of Mexico, and a concession has been granted for its extension 585 miles to the borders of Guatemala. Surveys are being made along the route, and it is believed that the construction will be completed at no distant day. We are informed that a survey is also being made for the connection of the Mexican line with the city of Guatemala, which will carry the line 120 miles further south, and leave only 60 miles to reach the northern border of Salvador. In Salvador a line has been projected through that state about 170 miles. To carry the line through Honduras in order to reach the nearest point of the Nicaraguan railway system is only about 90 miles, and this system, consisting of two sections of 58 miles and 32 miles in length, can be incorporated into the through line by uniting these two sections by a new line of about 35 miles. Through Honduras, Nicaragua, and Costa Rica the country is reported of a character very favorable to railway construction.

From the southern terminus of the Nicaraguan system to the boundary of Costa Rica and through Costa Rica to its railway, of which about 35 miles may be used in the through line, is about 210 miles. We are informed that a syndicate has acquired a concession and will build a line to connect with the railway already constructed. About 75 miles of this may be utilized, thus lessening by so much the distance to be constructed by the through line.

From the southern terminus of the Costa Rica Railway, the Atlantic coast may be followed to the northern border of South America, a distance of about 130 miles.

Thus to carry communication through Central America from the city of Mexico requires about 1,700 miles of railway, of which 295 miles are already constructed and in operation, about 780 miles are being constructed and surveyed, leaving 625 miles still to be located.

In the extreme south the railways of the Argentine Republic connect

with those of Chili, Uruguay, and Brazil, and extend northward to within 120 miles of the Bolivian frontier and are rapidly being pushed further. Concessions have been granted for the continuation of these lines, or rather for the building of a line to connect with them, and with the railways of Bolivia and Peru, which when completed will afford communication as far north as Cuzco in Peru, about 2,190 miles from Buenos Ayres.

Beyond this, northward to the boundary of Central America, little has been done toward an intercontinental line. Should it be located along the Central Plateau in the heart of the Andes, then a line which has been projected north and south 151 miles in Ecuador might be used, in addition to about 30 miles to be built in Peru near Cerro de Pasco. A French syndicate is also endeavoring to secure a concession in Colombia to build a line from Bogotá to Cartagena, and are said to have the capital to construct it; but it may be said that nothing has really been done, and especially so if the intercontinental line should be located on the eastern slopes of the Andes, through that rich but almost unknown country of the headwaters of the Amazon. From Cuzco in Peru to the railways of Costa Rica, about 2,300 miles, is found the one long link which the intercontinental line will be called upon to construct.

From the southern terminus of the railroads now in operation in Mexico to the northern terminus of the Argentine system is estimated at 4,900 miles. In this distance 230 miles are now in operation which may be utilized in the through line; of the remaining distance, about 1,800 miles are already under survey and construction, which when completed will leave about 2,890 miles to be located and constructed, in order to complete the line that will eventually unite the republics of the Western Hemisphere.

The distance between New York and San Francisco by the shortest rail route is 3,207 miles.

From every point of view, it seems clear to us that immediate steps should be taken to ascertain whether the acquisition of advantages of such transcendant importance as direct and unbroken rail transportation would give to all the republics of this continent, are really within our reach by any reasonable expenditure, or by the granting of reasonable concessions to capitalists who would undertake the construction and operation of the necessary railway, and give satisfactory security for the fulfillment of their engagement.

We strongly recommend to the International Conference that provision should be made for the appointment of an International Commission of Engineers, to make the necessary surveys and report upon the entire subject at the earliest possible date. We are of opinion that our Government will co-operate with the other republics in this matter, for its policy in the past has shown it to be most liberal in aiding, by grants of land and of money, all enterprises for the improvement of means of communication, nor has this policy been confined to exter-

private capital in our own territory, for the problem of interoceanic communication across the Isthmus of Panama, and through Central America, has received attention and obtained aid as early as 1834.

When the recommendations of this proposed commission are submitted to the various governments, they can then confer as to the best means of securing the union of the three Americas by unbroken and direct rail communications.

We must believe that a work which would confer such manifold advantages to all the countries interested, would so strongly commend itself as to induce them promptly to give it such encouragement and to take such measures as will lead to its early completion.

Area, population, exports, imports, and miles of railway in the Spanish-American countries and the United States.

Countries.	Area (sq. miles).	Population.		Exports.		
		Year.	Number.	Year.	Total.	To the United States in 1889.
Argentine Republic	1,125,666	1887	3,894,955	1887	$113,244,801	$5,454,618
Bolivia	772,548	1882	1,182,279	1885	9,745,000	2,136
Brazil	3,119,764	1888	14,002,335	1887	143,903,651	69,403,804
Chili	293,970	1865	2,527,320	1887	57,194,709	2,622,625
Colombia	504,773	1881	3,878,600	1887	10,637,295	4,263,519
Costa Rica	23,000	1883	203,720	1887	4,057,422	1,442,365
Ecuador	243,370	1885	1,004,651	1887	7,856,868	695,005
Guatemala	41,830	1888	1,427,116	1887	7,044,498	2,346,685
Honduras	47,090	1887	351,700	1887	1,296,000	1,215,561
Mexico	751,479	1882	10,447,984	1888	38,619,867	21,253,601
Nicaragua	49,500	1883	275,815	1886	1,770,413	1,747,246
Paraguay	142,916	1886	263,751	1886	1,325,272	None.
Peru	463,747	1876	2,621,844	1884	5,785,929	314,032
Salvador	7,225	1888	664,513	1887	5,101,143	1,662,162
Uruguay	72,175	1887	651,112	1887	27,373,172	2,986,964
Venezuela	394,374	1886	2,198,320	1886	15,884,728	10,392,569
United States	3,581,000	.....	.....	1889	742,401,375	.....
Central America (includes British Honduras)	175,045	.....	2,950,376	.....	20,902,102	8,625,484
South America (includes Guiana and the Falkland Islands)	7,546,158	.....	32,583,757	.....	373,713,387	92,135,052
Total of Mexico, Central and South America	8,492,682	.....	45,982,116	.....	433,235,356	122,014,137

Countries.	Imports.			Miles of railway, 1889.
	Year.	Total.	From the United States in 1889.	
Argentine Republic	1887	$81,467,056	$9,293,856	4,032.5
Bolivia	1885	6,820,000	6,838	106.2
Brazil	1887	114,335,667	9,531,081	5,260.5
Chili	1887	52,667,831	2,927,794	1,759.9
Colombia	1887	6,339,379	3,821,017	226
Costa Rica	1887	4,200,919	983,164	110.5
Ecuador	1887	8,333,254	756,211	40
Guatemala	1887	5,312,160	994,701	103.05
Honduras	1887	1,215,000	637,175	69
Mexico	1888	43,380,000	11,486,896	5,021.06
Nicaragua	1886	1,062,040	1,009,687	90
Paraguay	1886	1,399,777	None.	92
Peru	1884	8,044,069	780,835	1,037.01
Salvador	1887	3,186,798	701,196	32
Uruguay	1887	29,950,402	2,192,848	400
Venezuela	1886	12,053,502	3,738,961	196
United States	1889	745,131,552	.....	.....
Central America (includes British Honduras)	.....	15,800,285	4,695,521	372.05
South America (includes Guiana and the Falkland Isl'ds)	.....	364,838,005	35,021,017	13,170.02
Total of Mexico, Central and South America	.....	424,018,290	51,203,434	18,563.91

I.—*Total values of merchandise imported into the United States from the British North American Possessions and of merchandise imported from the United States into and entered for consumption in the British North American Possessions during each year from* 1850 *to* 1889, *inclusive* (see Note 5).

Years.	Imports into the United States from the British North American Possession.	Imports into the British North American Possessions from the United States.	Excess of imports into the United States.	Excess of imports into the British North American Possessions.
1850	$5,179,500	$11,608,641		$6,429,141
1851	5,279,718	14,263,751		8,984,033
1852	5,469,445	13,993,570		8,524,125
1853*	6,527,559	19,445,478		12,917,919
1854	8,784,412	26,115,132		17,330,720
1855	15,118,289	34,362,188		19,243,899
1856	21,276,614	35,764,980		14,488,366
1857	22,108,916	27,788,238		5,679,322
1858	15,784,836	22,210,837		6,426,001
1859	19,287,565	26,761,618		7,474,053
1860	23,572,796	25,871,399		2,298,603
1861	22,724,489	28,520,735		5,796,246
1862	18,515,685	30,373,212		11,857,527
1863	17,101,217	29,680,955		12,489,738
1864	20,608,736	7,952,401		
1865	32,264,403	27,269,158	$5,995,245	
1866	48,528,628	27,905,984	20,622,644	
1867	25,044,005	25,239,459		195,454
1868	26,261,378	22,644,235	3,617,143	
1869	29,293,766	21,680,062	7,613,704	
1870	36,265,328	21,869,447	14,395,881	
1871	32,542,137	27,185,586	5,356,551	
1872	36,346,930	33,741,995	2,604,935	
1873	37,649,532	47,223,171		9,573,639
1874	34,365,961	53,430,424		19,064,463
1875	28,270,926	50,319,993		22,049,067
1876	29,010,251	45,502,201		16,491,950
1877	24,277,378	53,524,029		29,246,651
1878	25,357,802	50,324,123		24,966,321
1879	26,133,554	45,196,601		19,063,047
1880	33,214,340	41,926,563		8,712,223
1881	38,041,947	50,955,925		12,913,978
1882	51,112,475	55,270,580		4,157,105
1883	44,740,876	65,018,933		20,278,057
1884	39,015,840	59,845,968		20,830,128
1885	36,960,541	53,397,608		16,437,067
1886	37,496,338	49,773,232		12,276,894
1887	38,015,584	51,937,050		13,921,466
1888	43,064,123	54,706,161		11,622,038
1889	43,009,473	57,412,887		14,403,414

NOTES.

1. All of the above data are given for years ending June 30, except that the imports into the British Possessions from 1850 to 1863 are for calendar years, and those for 1864 are for the six months ending June 30.

2. The imports into the British Possessions from 1850 to 1867 comprise the imports into the provinces of Quebec and Ontario, as taken from the Canadian accounts, plus the exports to the other provinces of the present Dominion, as taken from the United States accounts; the imports into the British Possessions for the remaining years are taken exclusively from the Canadian accounts, with the following additions from the United States accounts, viz: 1868, exports to British Columbia, $1,178,813; 1869, exports from Minnesota, $182,682; 1870, exports from Minnesota, $172,210; 1873 to 1889, exports from the United States to Newfoundland and Labrador. The accounts of these exports, which were exclusively by water, are reliable.

3. The imports into the United States for 1864 and from 1868 to 1887 include the imports from all British North American Possessions.

4. For the gradual formation of the present Dominion of Canada, see Statement No. 4.

5. The imports into the British North American Possessions from 1850 to 1875 inclusive are the imports entered for consumption, and those from 1876 to 1889 inclusive are the general imports of merchandise.

* Railway communication, Atlantic and St. Lawrence and Grand Trunk Railroad, established between the United States and Canada (between Montreal and Portland, Me.) in 1853.

II.—*Imports and exports of merchandise into and from the United States from and to Mexico, Central America, the West Indies, and South America during the years* 1821, 1830, 1840, 1850, 1860, *and from* 1866 *to* 1889 *inclusive.*

TRADE WITH MEXICO.

Years ending—	Export to			Imports from.	Total imports and exports.
	Domestic. *a*	Foreign.	Total.		
September 30—					
1821	(*b*)	(*b*)	(*b*)	(*b*)	(*b*)
1830	$985, 764	$3, 851, 694	$4. 837, 458	$531, 525	$5, 368, 983
1840	969, 938	1, 545, 403	2, 515, 341	716, 109	3, 231, 450
June 30—					
1850	1, 498, 791	514, 036	2, 012, 827	575, 200	2, 588, 027
1860	3, 309, 379	2, 015, 334	5, 324, 713	1, 903, 431	7, 228, 144
1866	3, 701, 599	871, 619	4, 573, 218	1, 726, 092	6, 299, 310
1867	4, 823, 614	572, 182	5, 395, 796	1, 071, 936	6, 467, 732
1868	5, 048, 420	1, 392, 919	6, 441, 339	1, 590, 667	8, 032, 006
1869	3, 835, 699	1, 047, 408	4, 883, 107	2, 336, 164	7, 219, 271
1870	4, 544, 745	1, 314, 955	5, 859, 700	2, 715, 665	8, 575, 365
1871	5, 044, 033	2, 568, 080	7, 612, 113	3, 209, 688	10, 821, 801
1872	3, 420, 658	2, 122, 931	5, 543, 589	4, 002, 920	9, 546, 509
1873	3, 941, 019	2, 323, 882	6, 264, 901	4, 276, 165	10, 541, 066
1874	4, 016, 148	1, 930, 691	5, 946, 839	4, 346, 364	10, 293, 203
1875	3, 872, 004	1, 865, 278	5, 737, 282	5, 174, 594	10, 911, 876
1876	4, 700, 978	1, 499, 504	6, 200, 572	5, 150, 572	11, 351, 144
1877	4, 503, 802	1, 389, 692	5, 893, 494	5. 204, 264	11, 097, 758
1878	5, 811, 429	1, 649, 275	7, 460, 704	5, 251, 502	12, 712, 206
1879	5, 400, 380	1, 351, 864	6, 752, 244	5, 493, 221	12, 245, 465
1880	6, 065, 974	1, 800, 519	7, 866, 493	7, 209, 593	15, 076, 086
1881	9, 198, 077	1, 973, 161	11, 171, 238	8, 317, 802	19, 489, 040
1882	13, 324, 505	2, 158, 077	15, 482, 582	8, 461, 899	23, 944, 481
1883	14, 370, 992	2, 216, 628	16, 587, 620	8, 177, 123	24, 764, 743
1884	11, 089, 603	1, 614, 689	12, 704, 292	9, 016, 486	21, 720, 778
1885	7, 370, 599	970, 185	8, 340, 784	9, 267, 021	17, 607, 805
1886	6, 856, 077	881, 546	7, 737, 623	10, 687, 972	18, 425, 595
1887	7, 267, 129	692, 428	7, 959, 557	14, 719, 840	22, 679, 397
1888	9, 242, 188	655, 584	9, 897, 772	17, 329, 889	27, 227, 661
1889	10, 886, 288	600, 608	11, 486, 896	21, 253, 601	32, 740, 497

a In the absence of law providing for the collection of statistics of exports to adjacent foreign territory over railways, the values of exports to Mexico since 1883 have been considerably understated. According to the official information from Mexican sources the value of imports into that country rom the United States during the year ending June 30, 1888, was $19,264,673, including precious metals valued at $38,362.

Railway connection established between the United States and Mexico April 10, 1884. (See Table III.)

b Not an independent country in 1821.

III.—*Values of merchandise and of gold and silver coin and bullion imported into and exported from the United States from and to Mexico during each year ending June* 30 *from* 1880 *to* 1889 *inclusive, and exhibiting the values of imports and exports by land separately by customs districts, and the total values of the imports and exports by water.*

MERCHANDISE.

Years ending June 30—	Carried in cars and other land vehicles.					
	Corpus Christi.		Paso del Norte.		Saluria.	
	Imports.	Exports.	Imports.	Exports.	Imports.	Exports.
1880	$453, 876	$643, 294	$196, 804	.....	$93, 989	$340, 348
1881	495, 816	664, 180	216, 566	.....	106, 878	175, 991
1882	345, 374	2, 049, 696	154, 973	$192, 379	131, 849	145, 191
1883	658, 194	1, 983, 294	325, 950	1, 162, 861	100, 084	850, 159
1884	490, 290	1, 626, 377	797, 967	962, 453	161, 617	891, 800
1885	756, 975	1, 154, 233	1, 058, 960	332, 935	232, 277	372, 231
1886	953, 184	1, 011, 196	1, 837, 396	51, 940	417, 168	145, 532
1887	905, 627	1, 050, 970	3, 531, 664	40, 909	210, 210	762, 569
1888	750, 258	1, 704, 086	4, 141, 534	32, 242	489, 297	1, 022, 588
1889	1, 510, 479	2, 119, 386	5, 115, 051	30, 551	1, 175, 832	1, 472, 078

III.— Value of merchandise and of gold and silver coin and bullion, etc.—Continued.

MERCHANDISE—Continued.

Years ending June 30—	Carried in cars and other land vehicles.					
	San Diego.		Other ports.		Total.	
	Imports.	Exports.	Imports.	Exports.	Imports.	Exports.
1880	$34,559	$14,488	.....	$35,847	$779,228	$1,033,977
1881	52,269	46,441	.....	77,807	871,529	964,419
1882	49,294	42,933	.....	4,780	681,490	2,434,979
1883	55,762	101,402	$119,363	219,317	1,259,353	4,317,023
1884	122,962	70,813	12,759	44,354	1,585,595	3,595,797
1885	61,912	62,241	566,240	59,531	2,676,364	1,981,171
1886	88,320	68,990	327,471	409,559	3,623,539	1,687,217
1887	83,950	89,337	271,270	98,498	5,009,721	2,042,283
1888	135,484	114,353	313,239	74,403	5,829,812	2,947,672
1889	164,611	192,928	375,584	79,909	8,341,557	3,894,852

Years ending June 30—	Carried in vessels.		* Total.		Total imports and exports.
	Imports.	Exports.	Imports.	Exports. *a*	
1880	$6,430,365	$6,832,516	$7,209,593	$7,866,493	$15,076,086
1881	7,446,273	10,206,819	8,317,802	.....	19,489,040
1882	7,780,409	13,047,603	8,461,899	15,482,582	23,944,481
1883	6,917,770	12,270,597	8,177,123	16,587,620	24,764,743
1884	7,430,891	9,108,495	9,016,486	12,704,292	21,720,778
1885	6,590,657	6,359,613	9,267,021	8,340,784	17,607,805
1886	7,064,433	6,050,406	10,687,972	7,737,623	18,425,595
1887	9,717,119	5,917,274	14,719,840	7,959,557	22,679,397
1888	11,500,077	6,950,100	17,329,889	9,897,772	27,227,661
1889	12,912,044	7,592,044	21,253,601	11,486,896	32,740,497

a See note to Table II.

COIN AND BULLION.

Years ending June 30—	Carried in cars and other land vehicles.					
	Corpus Christi.		Paso del Norte.		Saluria.	
	Imports.	Exports.	Imports.	Exports.	Imports.	Exports.
1880	$130,167	.....	$487,078	.....	$5,461	.....
1881	169,435	.....	425,097	.....	12,027	.....
1882	323,091	.....	313,753	.....	8,988	$8,762
1883	1,036,995	$22,950	1,076,606	.....	823	20,478
1884	1,350,835	875	2,946,736	.....	38,348	112,248
1885	781,103	37,818	9,418,959	.....	5,956	.....
1886	725,863	90,979	12,585,015	.....	9,136	.....
1887	698,904	23,767	10,598,215	.....	22,373	163,200
1888	491,866	32,687	10,225,041	.....	21,548	242,146
1889	513,927	10,318	13,103,596	.....	338,241	51,565

Years ending June 30—	Carried in cars and other land vehicles.					
	San Diego.		Other ports.		* Total.	
	Imports.	Exports.	Imports.	Exports.	Imports.	Exports.
1880	.....	.....	.....	.....	$622,706	.....
1881	.....	.....	.....	.....	606,559	.....
1882	.....	.....	.....	.....	645,832	$8,762
1883	.....	.....	$17,990	.....	2,162,414	43,428
1884	.....	.....	.....	.....	4,335,919	113,123
1885	.....	.....	.....	.....	10,206,018	37,818
1886	.....	.....	.....	.....	13,320,014	90,979
1887	.....	.....	.....	.....	11,319,492	186,967
1888	.....	.....	.....	.....	10,738,455	274,833
1889	.....	.....	.....	.....	13,955,764	61,883

...—Values of merchandise and of gold and silver coin and bullion, etc.—Continued.

COIN AND BULLION—Continued.

Years ending June 30—	Carried in vessels.		Total.		Total imports and exports.
	Imports.	Exports.	Imports.	Exports.	
1880	$9,880,114	$3,371	$9,115,824	$3,371	$9,119,195
1881	8,729,765	1,560	9,136,824	1,560	9,137,824
1882	5,980,706	9,654	6,631,958	18,446	6,650,384
1883	7,629,572	53,536	9,782,986	96,964	9,879,950
1884	5,679,362	229,512	13,615,991	235,635	13,351,536
1885	4,713,580	41,568	14,918,611	79,406	14,999,017
1886	2,615,282	19,656	16,935,396	110,635	17,045,431
1887	2,536,273	92,845	14,853,765	279,812	15,135,577
1888	3,294,182	44,575	14,632,637	319,408	14,352,045
1889	2,601,464	114,733	17,557,248	176,616	17,733,864

* The remarkable development of traffic in consequence of railway communication, established April, 1884.

RAILWAY CONSTRUCTION AS BEARING UPON POPULATION, WEALTH, AND DEVELOPMENT.

The miles of railway, population, and farming products are given up to 1889. The miles of railway are exact. The population given is from estimates made in the Census Office, and the products are from reports to the Agricultural Department. The statistics of manufactures and wealth are taken from the Census reports of 1880, and to these figures we have added for the increase since 1880 amounts equal to the increase shown between 1870 and 1880. It is certain that the forthcoming census of the present year will show figures greatly in excess of those we have given.

One of the greatest industries of the country, that of mining, which has developed perhaps more rapidly than any other, shows almost fabulous proportions in some sections we have omitted entirely, as we have been unable to find reliable statistics of the mining interests by States.

Railways, population, and wealth.

	Railways.	Population.	Wealth.
Arkansas (area, 53,850 square miles):	*Miles.*		
1860	38	435,450	$219,256,000
1870	256	484,471	156,394,000
1880	854	802,525	246,000,000
1888	2,046	1,140,000	336,000,000
Increase 1888 over 1860	2,008	706,550	116,744,000
California (area, 158,360 square miles):			
1860	23	379,994	207,874,613
1870	925	560,247	638,767,017
1880	2,220	864,694	1,430,000,000
1888	4,126	1,350,000	2,220,000,000
Increase 1888 over 1860	4,103	970,006	2,012,125,387
Illinois (area, 56,650 square miles):			
1860	2,790	1,171,951	871,864,282
1870	4,823	2,539,891	2,121,680,579
1880	7,851	3,077,871	3,092,000,000
1888	9,900	3,750,000	4,070,000,000
Increase 1888 over 1860	7,110	2,578,049	3,198,139,718
Kansas (area, 82,080 square miles):			
1860	.....	107,206	31,327,895
1870	1,501	364,399	188,892,014
1880	3,400	996,096	575,000,006
1888	8,755	1,518,000	961,118,000
Increase 1888 over 1860	8,755	1,410,794	929,790,105

Railways, population, and wealth—Continued.

	Railways.	Population.	Wealth.
Missouri (area, 69,415 square miles):			
1860	817	1,182,012	501,214,398
1870	2,000	1,721,295	1,284,922,897
1880	3,965	2,168,380	1,530,000,000
1888	5,901	2,750,000	1,775,000,000
Increase 1888 over 1860	5,084	1,567,988	1,273,785,602
Texas (area, 265,780 square miles):			
1860	307	604,215	365,200,614
1870	711	818,579	159,052,542
1880	3,244	1,591,749	725,000,000
1888	8,211	2,060,000	1,291,000,000
Increase 1888 over 1860	7,904	1,455,785	925,799,386

Products for the year.

	Corn.	Wheat.	Oats.	Potatoes.	Hay.	Cattle.	Value of manufactures.
Arkansas (area, 53,850 square miles):	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Tons.*	*No.*	
1860	17,823,588	957,601	475,268	418,000	9,356	567,799	$2,880,572
1870	13,382,145	741,736	528,777	422,196	6,839	357,935	4,629,234
1880	24,156,417	1,269,715	2,219,822	402,027	20,630	708,243	6,756,159
1888	42,608,000	1,794,000	4,848,000	864,000	56,235	824,539	8,883,159
Increase 1888 over 1860	24,784,412	836,399	4,372,732	416,000	46,877	256,760	6,002,581
California (area, 158,360 square miles):							
1860	510,708	5,928,470	1,043,006	1,789,463	305,655	1,180,142	68,253,228
1870	1,221,222	16,676,702	1,757,507	2,049,227	551,773	631,398	66,594,556
1880	1,993,325	29,017,707	1,341,271	4,550,565	1,045,119	664,307	116,218,973
1888	4,464,000	43,781,000	1,899,000	4,442,000	1,539,454	985,176	165,843,000
Increase 1888 over 1860	3,953,292	37,852,530	855,994	2,652,537	1,233,799	194,966	97,589,772
Illinois (area, 56,650 square miles):							
1860	115,174,777	23,837,023	15,220,029	5,540,390	1,774,554	1,583,813	57,580,886
1870	129,921,395	30,128,405	42,780,851	10,944,790	3,747,339	1,715,586	205,620,672
1880	325,792,481	51,110,502	63,189,200	10,365,707	3,276,319	2,384,322	414,864,673
1888	259,125,000	38,014,000	145,364,000	11,706,000	4,625,482	2,505,302	624,108,000
Increase 1888 over 1860	143,950,223	14,176,977	130,143,971	6,165,610	2,850,928	921,489	566,527,114
Kansas (area, 82,080 square miles):							
1860	6,150,727	194,173	88,325	296,335	56,232	93,455	4,357,408
1870	17,025,525	2,391,198	4,097,925	2,342,988	490,289	373,967	11,775,833
1880	105,729,325	17,324,141	8,180,385	2,894,198	1,601,932	1,451,057	30,843,777
1888	240,508,000	30,912,000	37,529,000	9,063,000	1,935,450	2,315,994	49,900,000
Increase 1888 over 1860	234,357,273	30,717,827	37,440,675	8,766,665	1,879,218	2,222,539	45,542,592
Missouri (area, 69,415 square miles):							
1860	72,892,157	4,227,586	3,080,870	1,990,850	401,070	1,168,984	41,782,731
1870	66,034,075	14,315,926	16,578,313	4,238,361	615,611	1,153,695	206,213,429
1880	202,414,413	24,966,627	20,670,958	4,189,694	1,083,929	2,080,932	165,386,205
1888	218,841,000	20,639,000	36,384,000	6,044,000	1,802,494	2,181,007	200,000,000
Increase 1888 over 1860	145,948,843	16,411,414	32,703,130	4,053,150	1,401,424	1,012,023	158,217,269
Texas (area, 265,780 square miles):							
1860	16,500,702	1,478,345	985,889	174,182	11,865	3,535,768	6,577,202
1870	20,554,538	405,112	762,263	208,383	18,982	3,494,043	11,517,302
1880	29,065,172	2,567,727	4,893,359	228,832	48,530	4,084,605	20,719,928
1888	83,698,000	6,189,000	14,808,000	700,000	189,795	7,923,090	30,000,000
Increase 1888 over 1860	67,197,298	4,710,655	13,822,111	525,818	177,930	4,387,322	23,422,798

THE RAILWAYS OF URUGUAY.

*REPORT OF ALBERTO NIN, DELEGATE FROM URUGUAY.**

WASHINGTON, *January* 6, 1890.

Mr. CHAIRMAN: To satisfy the desires of the committee over which you so worthily preside, I have the pleasure to send herewith a pamphlet arranged *ad hoc*, which contains all the legislation on railroads at present in force in Uruguay, and a map which graphically illustrates its railway system.

As the chairman will observe, this system radiates from Montevideo, capital of the Republic, and terminates, by way of the center, at the north and the extreme eastern and western limits on the frontier of Brazil, and by way of the west in the Uruguay River, which separates the Republic from that of the Argentine, so that its junction with whatever line may be established to put the country which I have the honor to represent in communication with the other nations of America would be as easy to carry out as it would be at once practicable, since the great trunk lines of the Uruguayan system will be complete and open to the public service in all extent during the present year.

The general railroad system law establishes, moreover, a valuable guaranty to the capitals invested by private enterprises, but notwithstanding these circumstances, I believe it proper to state, at this time, that if it should be necessary and advisable to join in obtaining the most perfect communication with the other nations of America, Uruguay would not be very far behind in conceding especial favors which would assure that result.

To this end, it is pleasant to me to salute the chairman with my most distinguished consideration and appreciation.

ALBERTO NIN.

Hon. JUAN F. VELARDE,
Chairman Committee on Railroads,
International American Congress.

* Translation.

THE RAILWAYS OF VENEZUELA.

*REPORT OF JOSÉ ANDRADE, DELEGATE FROM VENEZUELA, TO THE COMMITTEE ON RAILROADS OF THE INTERNATIONAL AMERICAN CONFERENCE.**

At the end of 1887 Venezuela had 232 kilometers of railroad open to public traffic and 407 kilometers under construction, besides 1,982 kilometers contracted for or projected.

Since 1887 there have been finished and opened to the public the line from Puerto Cabello to Valencia, 54 kilometers; that from Barcelona to the coal mines, 19 kilometers; that from La Luz to Barquisimeto, Tocuyo, and Trujillo, 350 kilometers, and that from Caracas to Trujillo, 54 kilometers. The construction of a railroad from Caracas to Victoria has also been begun, and is already well advanced, and it is now to be extended to San Carlos, beyond Valencia, under the name of the Grand Trunk Line of Venezuela. Lately contracts have been made for the construction of new lines which can not be specified at this moment. The Memoirs of Public Credit of 1888 and 1889, give an account of all these contracts with their minor details, and in those of the Treasury Department can be seen the annual earnings and expenses of the lines in actual operation.

In the Engineers' Handbook, published at Caracas in the same year of 1887 by Dr. Jesús Mª Muñoz-Tébar, present minister of public works in Venezuela, and perhaps the best-known railroad engineer in that country, will be found exact information about the native woods most employed in such works, with their common and botanical names, their resistance and price, the weight and price of brick, ballast, etc., and of various materials for pottery found near Caracas. It also contains the barometrical altitudes of some points of Venezuela in the neighborhood of Caracas, on the ridges of the central coast chain which divides the valley of Caracas from those of the Tuy; along the highway of the south which leads to those valleys; on the coast range of Venezuela, the peak of Naigevatá, and chair of Caracas; the Ávila and the other mountains to the north of Caracas; Agua Negra and the other mountains to the west of Caracas; and the interior chain between the rivers Tuy and Guárico. A copy of the Engineers' Handbook mentioned is herewith inclosed.

There is also inclosed a pamphlet abounding in information, entitled

* Translation.

"Document Relating to the Railroad of Ceiba," 1888, in Spanish, French, and English, together with a copy of the Statistical Annual of Venezuela for the year 1887, in which will be found, among other information, the following relating to railroads:

Complete list of railroads of Venezuela up to date, divided into three classes: Those constructed and in operation, those under construction, and those merely contracted for.
Diagram of the railroad from La Guayra to Caracas.
Diagram of the railroad from Caracas to Santa Lucía.
Diagram of the railroad from Puerto Cabello to Valencia.
Extract from the immigration law.
Extract from the land-grant law.
Extract from the law guaranteeing 7 per cent. upon capital invested in the construction of railroads.

It is probable that complete copies of all laws relating to railroads, and the Statistical Annuals for 1888 and 1889, may soon be presented to the committee.

No map of the Republic other than that found in the Statistical Annual can be found here, and I do not know in what part of the United States one of larger dimensions and equal accuracy can be obtained.

WASHINGTON, *January* 18, 1890.

APPENDIX

TO THE

REPORT

OF THE

COMMITTEE ON RAILWAY COMMUNICATION.

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LETTER OF TRANSMITTAL.

WASHINGTON, D. C., *March* 19, 1890.

GENTLEMEN: At your request I have obtained the following information with reference to the railways of Mexico, Central and South America, and the prospects of railway building in these countries, especially with reference to an intercontinental line. I have examined the libraries of the city, the Bureaus of the War, Navy, and other Departments, and have had the benefit of reading the reports of the Spanish-American Delegates to the railway committee.

The Spanish-American countries naturally form three groups, viz: Mexico, Central America, and South America. The topographical features of each group and of each country are briefly described. Where railway development is extensive, a mere statement of this is sufficient; where little has been done, more detailed information seemed necessary, and especially as to those countries which the Intercontinental Line would probably traverse. All the railways are given and the important ones described with such other information as seemed valuable; but details have been omitted when given in the reports of the Delegates.

A plan for an Intercontinental Railway has been outlined from a study of all the information obtainable; and, as a matter of interest in this connection, because of the diversity of existing gauges, and of the rapidity with which timber is destroyed in some of these countries, articles on railway gauges and metal ties have been added. Attention is also called to the method of making topographical surveys in various countries.

Tables are given of elevations and distances in these countries and of all the railways built and projected. Where no distinct statement of the distance between the two points could be found it was measured upon all the maps.

For future reference a list of the maps and books from which I have obtained information is submitted.

Very respectfully, your obedient servant,

GEO. A. ZINN,
First Lieutenant, Engineers, U. S. Army.

Hon. H. G. DAVIS and ANDREW CARNEGIE,
Members of the Committee on Railway Communication,
of the International American Conference.

MEXICO.

The railway system of this country has been so well developed that little need be said beyond describing the important lines. As early as 1837, a concession was granted for the building of a line from Vera Cruz to the City of Mexico; but the first real work was not done upon it until 1857. The success of this railway after its opening, in 1873, led to the projection of others by United States capitalists, having the City of Mexico as their objective points. The first of these to take tangible shape was the Mexican Central from El Paso, Tex., where it connects with the Southern Pacific Railway of the United States. The Mexican Government granted liberal concessions of money and land for the building of other lines, most of which have the City of Mexico as a terminal. The theory of these was to have, as well as the through line, branches leading to the Pacific and to the Gulf coast, and a glance at the map will show that some of these have been built. Some of the Mexican lines were projected from the United States to a good port on the Pacific coast to form transcontinental lines. The Sonora Railway and the Texas, Topolobampo and Pacific Railway are examples. The Tehuantepec line was projected to connect the Gulf directly with the Pacific.

A line has been projected from the City of Mexico to Central America, and is now under construction.

Many concessions have been granted by the Mexican Government for the building of railways, and it has been very liberal in donating money and lands; some of these concessions have been forfeited from failure to comply with the conditions imposed, and others are not likely to be carried into effect.

I have described first the lines leading south from the border line of Mexico and the United States, and then named the other lines:

SONORA RAILWAY.

The Sonora Railway, from Nogales, Mexico, to Guaymas, Mexico, 262.41 miles, was opened from Guaymas to Hermosillo, 90 miles, in November, 1881, and to Nogales in October, 1882. It is owned by the Atchison, Topeka and Santa Fé Railroad Company, and with the New Mexico and Arizona Railroad forms the Sonora Division of the Atchison Company's system of roads.

Leaving Benson the line takes a southwesterly direction through the lower part of Arizona to Nogales on the Mexican frontier, 88 miles distant.

This road extends through a fine cereal and grazing country. Another line is to be constructed from Hermosillo (263 miles from Benson), via Ures, Arispe, Bachnachi, and Espia, to Paso del Norte. The population of Guaymas is about 6,000.

When fast trains are put on the Atchison, Topeka and Santa Fé, the journey may be made from New York to Guaymas in five days and a few hours. This line is expected to facilitate communication with Australia, while it also gives traders of the Mexican, Central and South American coasts an opportunity to send their products

quickly to the Mississippi Valley, the East, and the large cities that lie between the Gulf of Mexico and the Great Lakes.

There is immense mineral wealth in Sonora; mines of gold, silver, iron, lead, copper, antimony, tin, and sulphur are found in the region adjacent to the railway. Deposits of carbonate of soda, alum, marble, salt, and gypsum are also abundant. One of the most important mineral deposits of Sonora is anthracite, recently discovered at Barranca on the Yaqui River. The coal is found in sandstone and conglomerate and is said to contain 90 per cent. of carbon. Among other products reached by this railroad are sugar-cane, tobacco, rice, rosewood, ebony, logwood, and Brazilwood.

The cost of its property was $10,972,796. Its earnings in 1888 were $221,761.99.

MEXICAN CENTRAL.

The Mexican Central from El Paso, Tex., to the City of Mexico, 1,224.1 miles, with branches from Aguas Calientes to San Blas on the Pacific coast, and to Tampico on the eastern coast, from Silao to Guanajuato, 11.4 miles, and from Guanajuato to Irapuato, 161 miles. Of the San Blas division only 16.6 miles are completed, and of the Tampico division, the line to San Luis Potosi, 130.7 miles was opened in June, 1889, and at the present time there remains less than 50 miles to be completed. It is believed that the entire division will be opened for traffic by March 31, 1890.

This is the longest of any Mexican line, and has a subsidy of $9,500 per kilometer, or in all amounting to about $32,000,000. It runs through a country rich in mineral and agricultural resources, and connects the largest centers of population in Mexico, although it crosses certain areas of sterile plains in the north.

This road was incorporated in Massachusetts February 25, 1880, and in the same year purchased of the Guanajuato Railway Company 60 kilometers of narrow-gauge railway, which was widened and incorporated into the main line. The entire main line was completed March 8, 1884, and opened April 10, 1884. The Guadalajara division was opened from Irapuato, May 21, 1888.

The subsidy acquired by this company covered the main line, the Tampico and Guadalajara divisions, and is payable from custom-house receipts. The company has the right to import free of duty all material required for construction, maintenance, and operation of its lines, is exempted from taxation till the expiration of fifty years after completion of all the lines, and has the right to construct and operate its telegraph lines for ninety-nine years. Small additional subsidies were given by the State governments of San Luis Potosi and Guanajuato. The Government of Mexico, on June 1, 1885, suspended the payment of its subsidy.

This road runs through the center of the great plateau, the healthiest region in the world. As a rule the grades are gentle, but exceedingly rough hill-work was found in the States of Guanajuato, Zacatecas, and Durango, and near the City of Mexico. The road passes through Chihuahua, 12,000 inhabitants; Zacatecas, 30,000; Aguas Calientes, 31,880; Silao, 4,000; Guadalajara, 71,000; San Luis Potosi, 34,000; Tampico, 7,000; Queretaro, 48,000; Guanajuato, 63,000; Celaya, 10,000; Irapuato, 21,000; Leon, 74,000; Mexico, 260,000.

	Miles.
Main lines, City of Mexico to El Paso	1,224.0
Guanajuato Branch, Silao to Guanajuato	11.4
Branch to stone quarry	6.5
Tampico division, Tampico, westerly	117.8
Tampico division, main line junction to San Luis Potosi	130.7
San Blas division	16.6
Guadalajara division, Irapuato to Guadalajara	161.0
Total length of lines owned, 1888	1,668.0

Average number of miles operated during the year, 1,316.4. Gauge, 4 feet 8½ inches; rail, steel, 56 pounds.

Operations for year ending December 31, 1888.—Train mileage, passenger, and freight statistics not reported. Earnings, $5,774,331.31, or $4,386.40 per mile.

Expenses:	
Maintenance of way	$782,523.18
Maintenance of cars	218,102.96
Motive power	1,416,425.86
Transportation	819,463.99
Miscellaneous	181,321.57
Total, ($2,597 per mile)	3,418,837.56
Net earnings (40.79) per cent	2,355,493.75

This is net currency. Equivalent in United States money to $1,748,451.95.*

Railway commerce.—The Mexican Central Railway, from El Paso del Norte to the City of Mexico, was completed in 1884, and Paso del Norte, as its northern terminus, at once became the most important town on the frontier. The commerce of the place sprang almost immediately from insignificance to considerable proportions, and is now exceeded by but one city in the whole Republic. Not only did the through traffic swell beyond all comparison with its former condition but the local trade was also augmented. The Mexican collector of customs informed me that in 1884 he forwarded to the ministerio de hacienda an estimate of the amount of merchandise on hand at Paso del Norte, in the stores of the place, which he then computed, approximately, as amounting to $50,000. Effects on hand in these establishments, which are principally retail, can not now be estimated at less than twelve times that value.

It was thought by many that the construction of the International Railway through Piedras Negras and of the Mexican National at Laredo would divert much of the traffic from the Mexican Central, and consequently diminish the commercial importance of El Paso and Paso del Norte. Both of the first named routes are much shorter than the Mexican Central line, as will be seen from the following table:

Distances to City of Mexico from—	Via El Paso.	Via Eagle Pass.	Via Laredo.	In favor of Laredo over El Paso.
	Miles.	*Miles.*	*Miles.*	*Miles.*
New Orleans	2,433	1,836	1,578	855
New York	3,640	3,210	3,015	634
Chicago	2,866	2,471	2,236	630
St. Louis	2,584	2,189	1,950	634
Kansas City	2,398	2,080	1,821	577

This greater proximity to the centers of commerce above enumerated resulted during the first four months, in the loss of considerable traffic to the El Paso route, but recently much of this business has returned to the Mexican Central, and but little apprehension is entertained of any permanent loss from the competition and advantages offered by the rival roads.

It is claimed that the Mexican Central places freight in the City of Mexico in less time than the Mexican National, notwithstanding the greater distance over which their merchandise is transported. This dispatch may be explained partly by the superior organization and partly by the superior road-bed and equipments of the first-named railway. The Mexican National labors under the disadvantages of a narrow gauge, and the International is obliged to pass their cars over the Central line from Laredo to the City of Mexico. In addition to this, the Mexican Central connects the important cities of Chihuahua, Laredo, Zacatecas, Queretaro, Aguas Calientes, Guanajuato, Guadalajara, and Leon, the commerce of which this road will always control.—(Report of Consul Mackey, Paso del Norte, March 22, 1889.)

MEXICAN NATIONAL.

A concession generally known as the Palmer-Sullivan concession was granted to the Mexican National Construction Company by an act of the Mexican Congress of September 13, 1880, for the following named lines of railway: From the City of Mexico to the Pacific coast at the port of Manzanillo, or between that port and La Navidad, passing through the towns of Toluca, Maravatio, Acambaro, Morelia, Zamora, and La Piedad, and from a point on the foregoing line between Maravatio and Mo-

* Poor's Manual.

relia to a point on the northern frontier at Laredo, or between Laredo and Eagle Pass, passing through the towns of San Luis Potosi, Saltillo, and Monterey; the railroad thus constructed to be 3 feet gauge. An additional concession given January 10, 1883, granted the right to extend this system from the port of Matamoros through Mier to Monterey, and from San Luis Potosi through Zacatecas to Lagos. These concessions granted the payment of a subvention of $11,270 per mile ($7,000 per kilometer) on the line from the City of Mexico to the Pacific and of $10,460 per mile on the line to the northern frontier. They granted the right to bring materials duty free, right of way over government lands, right to all mineral deposits discovered, exemption from taxation, and other privileges and immunities. The company was bound to complete 280 miles of track every two years, the line to the Pacific within five years, to the northern frontier in eight years, dating from September 30, 1880; and at the end of ninety-nine years the railway should revert to the Government, with the right to purchase rolling stock from the company. The time was afterwards extended to completion in ten years from July 15, 1886, the distance was reduced to 155 miles in each two years, and a fine was imposed if this should not be complied with, and other minor modifications. Construction was begun October 14, 1880. The division from Laredo through Monterey to Saltillo, 236 miles, was completed September 14, 1883. The southern division was completed from City of Mexico through Toluca to San Miguel de Allende, 254 miles, November 29, 1883.

The Pacific division was completed from Acambaro through Morelia to Patzcuaro June 1, 1886. This line had been surveyed all the way to Colima through Uruapan. The Matamoros division is completed to San Miguel, 75 miles. The section between Zacatecas and the suburb of Guadalupe, 5 miles, is operated at present by animal traction and was purchased in 1881. The company has also acquired, by purchase, the line between the City of Mexico and El Salto, and the line through Texas from Laredo to Corpus Christi, 161 miles. A few miles of track has been laid from the port of Manzanillo. By the concession of June 2, 1883, the company was granted the right to construct a line completely around the City of Mexico, with branch lines to Tlalpam, San Angel, and Contreras. Of this line, called the Cintura or Belt, the important section that connects the several railways entering the city is completed and in operation.

The property of this company was sold under foreclosure May 23, 1887, and the company was reorganized. (For reorganization see Poor's Manual for 1887, page 935.) The through line was completed September 28, 1888, and opened for traffic November 1, 1888.

This road passes through the important cities of Monterey, 42,000; Saltillo, 17,000; San Luis Potosi, 34,000; Acambaro, 17,000; Maravatio, 12,000; Toluca, 12,000; Morelia, 25,000; Colima, 31,000. It is expected that the line from San Miguel to Laredo will be completed in fifteen months from July, 1889.

	Miles.
Main line of road, City of Mexico to New Laredo	838.63
El Salto line, City of Mexico to El Salto	42.41
Patzcuaro branch, Acambaro to Patzcuaro	95.85
Belt line, Santiago to La Garita de San Lazaro	3.17
Matamoros division, Matamoros to San Miguel, Mexico	75.50
Texas Mexican Railway, Corpus Christi to Laredo and branch	162.03
Brownsville and Gulf, Rio Grande River through Brownsville, Tex	1.00
Total of above lines	1,218.59
Add lines named in paragraph following	13.65
Total length operated December 31, 1888	1,232.24

Gauge 3 feet; rails, steel and iron, 40 and 45 pounds.

In addition to the above mileage are the following lines which are unused or used only as side tracks, special service tracks, and tramways: El Salto towards Tepeji, 2.5; Quarry branch from Naucalpan Junction to Quarry, 2.8; branch in New Laredo, 1.

Operations for 1888.—Train mileage, passenger, and freight traffic not reported.

Earnings:	
Passenger	$599,194.00
Freight	1,649,347.83
Mail	11,227.14
Other earnings	145,121.70
Total	2,404,891.53
Expenses:	
Transportation	509,883.10
Motive power	820,007.57
Maintenance of cars	97,278.47
Maintenance of way	753,199.35
Extraordinary expenses	45,081.90
General expenses	115,630.00
Total	2,341,086.43
Net earnings	63,811.10

Reduced to United States currency this equals $51,048.88. Add interest, discount, and exchange, $71,022.44. Available revenue, $122,071.32 Paid interest on Texas, Mexican Railway Company bonds, $60,880. Balance surplus, $61,191.32.*

A loan of $8,000,000 has recently been negotiated for the purpose of purchasing new rolling stock and laying a third rail from Laredo to the City of Mexico—work to begin at once.

THE MEXICAN INTERNATIONAL.

This company was organized December 9, 1882, under special charter from the State of Connecticut. In 1883 it acquired certain concessions granted by the Government of Mexico under date of June 7, 1881, November 4, 1881, April 1, 1882, which authorized the construction and operation of a line of railroad and telegraph between the City of Mexico and the Rio Grande, terminating at or near Piedras Negras (Eagle Pass), with the right to construct another line from a convenient point on the main line to some point on the Gulf of Mexico, between Matamoros and Vera Cruz; also another line to the Pacific Ocean at some point between Mazatlan, Zihuatanejo, and also such branches as the company deem desirable from each side of the lines above mentioned, said branches to be subject to the approval of the department of public works and not to exceed 100 miles each in length.

It is stipulated in the concession that the road and its appurtenances shall be exempt from taxation for fifty years, and that the materials required for construction, operation, and repair of the road shall be free from import and other duties. No subvention is granted, but the Government has obligated itself not to give a subvention to any other line of railroad within 50 miles on either side of the lines so authorized. About 70 miles, extending from Piedras Negras to Sabinas and including the part within Mexican territory at the International bridge over the Rio Grande, were completed in 1883. In 1884, 89.37 miles of the main line were completed, and also 10.84 miles of the Lampazos branch, the latter thus reaching the coal fields of San Felipe. The track of the main line was completed January 12, 1888, to Torreon, where connection is made with the Mexican Central Railroad. The operation of the road to Torreon was commenced March 1, 1888.

The theory of all these lines is to have an interoceanic line, as well as a main line north and south.

Main line, Piedras Negras, Mexico to Torreon, Mexico, 383.4 miles. Lampazos Branch, completed from near Sabinas Station on main line to Hondo, 12.31 miles. Total 395.71 miles.

Gauge, 4 feet 8½ inches; rail, steel, 54 pounds.

* Poor's Manual.

THE MEXICAN SOUTHERN.

From Laredo another road was projected to the City of Mexico. The original concession for building it was granted May 26, 1881. It has been called "*The Mexican Southern*," "*The Mexican Oriental*," "*The International and Interoceanic*."

The following is a condensed itinerary of this route:

A station had been erected at New Laredo, and on September 1, 1883, about 100 miles of road had been graded, but only half a mile of track had been completed. From New Laredo the route will follow the course of the Rio Grande to Meir, via Guerrero. Leaving Mier the road goes southward to China. The company has the option of constructing a branch to Matamoros, 100 miles distant from Mier. There are wagon roads from China to Monterey (60 miles) and also to Matamoros (90 miles). The line then passes to the eastward of Teran and Linares, running almost due south from China to Victoria, 270 miles from New Laredo. It lies on the border of the *Tierra templada*. From Victoria the line will have a southeasterly direction, crossing the Rio Panuca near Tanjuco, 45 miles from its mouth.

The company has the option of building branch roads to Tampico and to San Luis Potosi, but it is not probable that it will compete with the Mexican Central between these points.

The line will be easy to construct as far as Victoria. South of this station it will extend through the mountains on the eastern edge of the great table-land, and will require rather heavy grades and some tunneling. This division will traverse the Huasteca country, one of the richest portions of the Republic both in agricultural products and mineral deposits.

The proximity of this railway to the sea-board should also be considered. This company has also the choice of extending branch roads to Tuxpan and Vera Cruz. This would, of course, be a formidable opposition line to the Mexican Railway. Judging from the topography of the country, this road will be easier to construct than the Mexican Railway.

The southern division may be described as follows:

Leaving the City of Mexico the line will run parallel with the Mexican Railway (it is not allowed to cross it) to Irolo, 45 miles from the City of Mexico the track will be continued over a level country to Puebla (111 miles), thence southeasterly to Tehuacan (182 miles), from which place there is a tramway to Esperanza, on the Mexican Railway, 31 miles distant.

The road will go south from Tehuacan, following the Rio Salado for several leagues to Arenal, where the Salado and Cuicatlan Rivers unite and form the Rio Quiotepec. Arenal is 237 miles from the capital. A branch line is under construction from Anton Lizardo, on the Gulf of Mexico, toward Arenal via Amapa and Tuxtepec. Anton Lizardo is 142 miles from Arenal Junction. The former town is the only good port on the Gulf coast. The eastern division will be extended to Vera Cruz 23 miles distant. But little artificial grading will be required on the eastern division, and the heaviest grade, according to the surveys, is 72 feet to the mile.

From Arenal the main line will run almost due southward along the Rio Cuicatlan through a well-timbered region to Sedas (301 miles), and thence to Oaxaca, 350 miles (population 26,228, elevation about 5,000 feet). Leaving Oaxaca the railway will run southward with a descending grade to Amatlan, Ejutla, and Miahuatlan, the latter being about 65 miles from Puerto Angel, the principal port of the State, and at which the Pacific Mail steamers touch.

From Miahuatlan the road takes an easterly course over a rugged country to the town of Tehuantepec (523 miles), 10 miles from La Ventosa on the coast. The Pacific Mail steamers stop at the adjoining port of Salina Cruz, which has a good harbor and will become the terminus of the projected railway across the Isthmus. The Mexican Southern will make connection with the Tehuantepec road at the station of that name. The former road will be extended eastward from the town of Tehuantepec

(population 12,000) to Tonala on the coast, where the Pacific Mail steamers stop once a month. Leaving Tonala the main line bifurcates, one branch running northeastly to San Cristobal, the other to Tapachula and thence probably to the City of Guatemala.

The region traversed by the southern division of this railway lies mostly in the States of Vera Cruz, Oaxaca, and Chiapas. It is very rich in mineral deposits and agricultural products. The climate is salubrious and the vegetation luxuriant along the greater part of the route. The State of Oaxaca contains valuable mines of gold, silver, iron, copper, and mercury; the cereals, brown beans, and tobacco, are grown in abundance, and petroleum is found near Puerto Angel. The States of Vera Cruz and Chiapas are rich in coffee, sugar cane, cocoa, tobacco, indigo, vanilla, and India rubber.

Here (Laredo) the "Oriental," the southern corner of the vast Gould system of railroads, leaps straight across the river, penetrates the *tierra caliente*, or hot coast region, and draws a direct line for Mexico City. Thence it will be continued southward to the "Mexican Southern," a concession controlled by General Grant, and eventually may penetrate the confines of Guatemala, and even Central and South America. Who knows? With a management presided over by the greatest general of our armies and the skillful organizer of our railways it is possible that within a decade of years one may obtain over the Gould system of roads a through ticket from New York to Panama or from St. Louis to Quito. *

Mexico has almost no navigable streams, and hence the railway would seem to furnish the instrumentality indispensable to her future development.

The Mexican Southern Company has recently issued $2,940,000 of preferred stock and $2,450,000 of common stock to aid in the construction from Puebla to Oaxaca, 249 miles. The present issue is to complete the road from Puebla to Tecomavaca, 139 miles. It is said that the surveys are complete to this point. The grading is complete from Puebla about 90 miles, and a very large force is now at work. The entire line is to be completed in two years. It will connect with the Interoceanic and the Mexican Central at Puebla, and will have a gauge of 3 feet.

The following is given in the Engineering News of January 11, 1890:

Salvador Malo, of the City of Mexico, has taken over the concession known as the Fenelon concession for a railroad from Oaxaca to Tehauntepec.

CONTINENTAL RAILWAY.

A concession was granted November 15, 1889, to Feliciano San Roman for the construction of a railway from Matamoras to Tuxpan, thence one branch to the city of Mexico, and another to connect with the National Railroad of Tehuantepec, from which connection one branch is to be built to any port in Yucatan and another branch to the boundary line of Guatemala. Construction is to commence in two years and the line is to be completed in twenty years. The Government grants a subsidy of $18,000 per kilometer in 5 per cent. bonds and gives the company all mineral lands and marble quarries along the right of way.

Some years ago a concession was granted to Count Telfener for a railway called the New York, Texas and Mexican Railroad to be built from Matamoras through Tampico and Tuxpan to the City of Mexico. This concession was forfeited, but a renewal of it has recently been secured by General Treviño.

MEXICAN RAILWAY.

Vera Cruz to City of Mexico 264 miles. In 1837, the first Government decree was issued granting a concession for the building of this railroad, but the projector was unable to construct any portion of it and the grant was declared forfeited. The first real work was begun in 1857, when Don Antonio Escandron secured the right to construct a line from the Gulf of Mexico to the Pacific. This concession was transferred

* Obers: 'Travels in Mexico.'

in 1865, and work was begun at either end; after many delays trains commenced running between Orizaba and Vera Cruz September 5, 1872, and on January 1, 1873, the entire line was completed. Its success led to seeking connection with the United States and many concessions for such lines were granted by the Government with subsidies of about $8,000 per kilometer. Most of these have been merged into the greater lines.

Senor Romero has said:

As a test of the capabilities of this road, let us make a comparison between the earnings of the Vera Cruz Railroad and roads similarly situated in the United States. Probably the two lines combining more nearly than any others similar conditions are the Union Pacific and the Central Pacific, having heavy mountain grades, long stretches of high table lands, and sea-coast connections. An examination of the official report shows that in 1880 the gross earnings per mile of these three roads were, Union Pacific, $11,304; Central Pacific, $7,818; Vera Cruz, $12,662. The net earnings per mile were as follows: Union Pacific, $6,168; Central Pacific, $3,913; Vera Cruz, $7,330. The reports for 1885 show as follows: Gross earnings Union Pacific, $12,516; Central Pacific, $8,758; Vera Cruz, $16,489. Net earnings: Union Pacific, $6,207; Central Pacific, $8,758; Vera Cruz, $10,098. It will thus be seen that for the last year, the Vera Cruz road made a net earning of 6 per cent. upon a capital of $168,000 per mile. A very liberal estimate would not place the cost of construction to-day at more than $50,000 per mile, upon which the present net earnings would be a return of about 20 per cent.

This line has a branch from Apizaco to Puebla, 29 miles in length, and operates the Jalapa Branch Railway from Vera Cruz to Jalapa, 70.75 miles.

THE INTEROCEANIC RAILWAY OF ACAPULCO AND VERA CRUZ.

This road was registered April 30, 1888, and projected to run from Acapulco, on the Pacific Ocean, to Vera Cruz, on the Atlantic, passing through the cities of Morelos, Yautepec, Amacusac, Mexico, Irolo, Calpulalpam, San Martin, Vireyes, Perote, and Jalapa; with branches from Vireyes to San Juan de los Llanos, from San Lorenzo to San Nicholas, and from Yautepec to Cuernavaca. For fifteen years the company may import, free of all duties, federal and local, material for construction, operation, and rolling-stock. The company is obliged to build at least 50 kilometers of track each year (beginning July 1, 1887), over and above the 467 kilometers (289.5 miles) already built, as follows: Mexico to San Martin, via Irolo, 123.6 kilometers (76.6 miles); San Martin to Puebla, acquired by the coal company, 37 kilometers (22.9 miles); Puebla to Jalapa, via Vireyes and Perote, 89.7 kilometers (55.6 miles); Vera Cruz to Jalapa, 25 kilometers (15.5 miles); Mexico to Yautepec, 158.3 kilometers (94.4 miles); total, 268.6 miles. Branches: San Lorenzo to San Nicholas, 22.3 kilometers (13.8 miles); Vireyes to San Juan de los Llanos, 11.3 kilometers (7 miles); total branches, 33.6 kilometers (20.8 miles); total of all lines 289.5 miles. The company must finish said lines within the maximum term of twelve years, counting from July 1, 1887. The company has purchased the Puebla and San Marcos, running from Puebla to San Marcos, on the Mexican Railway, 35.4 miles, and has under construction a connection from La Luz to Vireyes, on the Puebla road. Control was also acquired in 1884 of the Mexican Carboniferous Railroad, projected from Puebla south to the coal fields; and in 1886 the Mexican Government sold to this company the Puebla and San Martin Texmelucan Railway from Puebla to San Martin, 15 miles, with the stipulation that the road is to be speedily completed—the guage is 3 feet and rail steel, 40 pounds.

An idea of the construction of this road in a difficult part is given in the following quotation:

From Ozumba the descent begins. Its steepest portion is in the next 10 miles, where the lines twist backward and forward along the sharp declivity in order to obtain a sufficiently easy grade. At several points in this curving descent three lines of track at different elevations lie close together. From Nepantla the road is much less steep, but all the way to Cuautla the road is down hill. Beyond, the road continues through the cane country to Yautepec.

This line is complete from Mexico City to Perote, 160 miles, and the Morelos line has been completed to Tlalizapan.

From a point 25 miles south of Cuernavaca this line will run entirely within Guerrero, a State possessing immense mineral wealth almost totally undeveloped.

The Interoceanic Railway, a narrow-gauge road from Vera Cruz to the City of Mexico and thence to Acapulco, has been in contemplation for several years, but the necessary capital to carry it through has been wanting. At one time a French company was formed, but it failed to accomplish anything. Finally English capital was induced to take hold of the enterprise. After a survey of the route by civil engineers, sent out for the purpose, a company was organized with a capital of £3,500,000 sterling. That was over a year ago. It has been actively at work about nine months. From a civil engineer connected with the company I learn the following facts:

The work done thus far has been on the Vera Cruz division, which, it is expected, will be finished and in active operation in about a year. A new contract has been made by the company with the Mexican authorities for the Acapulco division, of the terms of which I am not advised. There are now at work on the division being built about six thousand men. The line is complete from the City of Mexico to Perote, 160 miles. That from Perote to Vera Cruz, 133 miles, is under construction.

On the Acapulco division there are 95 miles of railway in operation, from the City of Mexico to Yautepec, which was purchased by the Interoceanic Company. In this connection I would remark that the Interoceanic Company has purchased two other lines on the Vera Cruz division—the road from Puebla to San Juan, 90 miles, and from Vera Cruz* to Irolo, 40 miles.

The distance from Acapulco to the City of Mexico, in a straight line, this engineer informs me, is about 285 miles; as the road will probably be run it will reach 386 miles. The route has not been as yet defined or determined. It may not be run direct to the City of Mexico, but make a divergence at or near Chilpanzingo and connect with the Vera Cruz line at Puebla. While this will not materially lengthen the distance to the City of Mexico, the change will shorten the route from Acapulco to Vera Cruz.

The most difficult portion of the work is between Acapulco and Chilpanzingo, a distance of 108 miles. The route is hilly and mountainous, the hills running transversely across the route, thus rendering the engineering laborious and costly. The character of these elevations can be conjectured from the fact that Chilpanzingo is between 5,000 and 6,000 feet above the level of the sea.

The most important fact connected with this brief summary is the certain construction of this important railroad, which will be of immense benefit in the development of this portion of Mexico and to its commerce. It will open, besides, a new and brilliant future to Acapulco, utilizing its splendid harbor and opening to its people new and varied industries. On the completion of this work depends the future of the town and the development of this section. (Report by Consul Loughery, Acapulco, August 22, 1889.)

RAILROAD FRANCHISE IN MEXICO.

Mention has already been made of a railroad concession having been granted on December 5, 1887, for a line to commence at the port of Mazatlan (consular district of Mazatlan), State of Sinaloa, to extend to the northwest, nearly parallel with the coast line of the Gulf of California into Sonora, to connect with the Sonora Railway at some convenient point north of Guaymas. This franchise or contract was not formally confirmed by the President of the Mexican Republic until February 23 of this year, and is a modification of the franchise or contract of the Sinaloa and Durango line which was signed on July 5, 1886.

It is proposed that this line shall pass through Culiacan, the State capital of Sinaloa, into Sonora, touching at Alamos, and, as before stated, connecting with the Sonora Railway.

The contract also includes a road from Culiacan or Mazatlan to some point in the State of Durango, with right to continue the line through the State of Coahuila to the Rio Grande, and to construct branches from either side of the lines, each branch not to exceed 62.14 statute miles in length, the said branches to be designated to the executive within five years from date of signature of the franchise.

From the port of Altata to the city of Culiacan a railway 35 miles in length is in operation. This piece of road was constructed under a concession granted to the government of the State of Sinaloa on the 15th August, 1880. The time allowed for commencement and completion of the surveys and construction of the line is the same as that stipulated by the concession of July 5, 1886, but extended so as to count from February 23 of this year.

* Probably the City of Mexico.—G. A. Z.

The concession confers right to construct and operate docks, wharves, warehouses, telegraphs, etc., as is usual in such contracts.

The road is to be standard guage, the maximum of grades to be 4 per cent. and the minimum radius of curves to be 325 feet. The weight of rails to be 60 pounds to the yard.

The company formed to carry out this contract can issue bonds at not less than $15,000 nor more than $25,000 per kilometer, and can mortgage the line at a rate not to exceed $150,000 per kilometer. The subsidy given by the Government is to be $8,000 per kilometer (equal to $12,874 a statute mile), in bonds denominated "railway subsidy bonds," bearing 6 per cent. interest, payable by the Treasury every six months.

At the end of ninety-nine years the road and all its equipments is to become the property of the Government.

Referring to a franchise granted by the Mexican Government in November of last year, mentioned in my general report of that year, for the construction of a line of a railroad from Guaymas to Alamos, 240 miles distant, a reconnaissance of the route has been made, but no work of construction has yet been commenced, nor has any material arrived. (Report by A. Willard, U. S. consul, Guaymas, Mexico, March 19, 1888.)

THE TEXAS, TOPOLOBAMPO AND PACIFIC RAILROAD

(American and Mexican Pacific Railway) was projected, of standard gauge, to run from Eagle Pass to Topolobampo, with branches to Presidio del Norte, Alamos in Sonora, and the port of Mazatlan. The concession was granted June 22, 1880, with a subsidy of $18,050 per mile. The company was organized in March, 1881, under the name of the Texas, Topolobampo and Pacific Railroad Company, but in 1883 the name was changed to the American and Mexican Pacific Railway Company. The total length of the line was to be about 1,500 miles, of which 93 miles are surveyed and 35 miles graded from the harbor to the Rio Fuerte. This route was to be the shortest transcontinental line to Australia and Asia that could be laid down on the map. It claimed to have at Topolobampo, within the Gulf of Mexico, one of the few fine harbors of the Pacific coast. These harbors are spaced at wide intervals. That at the Columbia River is the highest up, then 600 miles south is San Francisco, 441 miles below this is San Diego, 650 miles farther on in a direct line, or 936 doubling Cape St. Lucas, is Topolobampo, and 740 miles south of this again is Acapulco. Between them there is nothing that can be called a harbor.

The concession granted to the Texas, Topolobampo and Pacific Railway Company has been officially declared forfeited. The concession was originally granted in June, 1881, and modified afterwards in a manner favorable to the company, the company being obliged within a year from the final modification in 1888 to build at least 50 kilometers of road, which was not done. The company loses the forfeit money, amounting to $90,000. (Telegram, City of Mexico, January 6, 1890.)

TEHUANTEPEC RAILWAY.

In 1841 the Mexican Government granted a concession to Don José de Garay to make a connection between the two oceans, providing that the grantee should make a survey, at his own expense, of the ground and the direction which the route should follow, and also of the ports which might be decreed most convenient from their proximity. A survey was duly made and the reports were published. The route was not necessarily to be a canal, although Señor Moro, the engineer, based his operations upon this assumption.

Soon after the termination of the war with the United States, the franchise of Señor de Garay became the property of Mr. P. A. Hargous, of New York, who, in connection with a company organized in New Orleans, assumed the rights and responsibilities of the Garay grant. After negotiations with the Mexican Government, and unavoidable delays, it was agreed that a railroad would be more practicable than a canal. Accordingly a survey for a railway across the isthmus was made in 1851, under the direction of the late General J. G. Barnard, of the U. S. Army, who was detailed for that purpose. The surveys demonstrated that a railway would be feasible at a moderate expense, that the grades did not exceed 60 feet per mile except at the

Chivela Pass, where they were 116 feet per mile for the distance of 8 miles, and that the summit was 720 feet above the sea level. In 1857 the railroad project was resumed and a new survey was executed under the direction of Col. W. H. Sidell, U. S. Army, but owing to various reasons this line was never constructed.

In 1870, the Tehuantepec Railway Company was formed in New York. Mr. Simon Stevens became its president, with the late Hon. Marshall Roberts as promoter. New urveys and exploration were made, but the road was not built under this administration. Upon a reorganization of the company, with Mr. Edward Larned, of Pittsfield, Mass., as president, and under a charter from the State of Massachusetts, a modified concession was obtained from the Mexican Government on June 2, 1879, to build the Tehuantepec Railroad. A subsidy of $7,500 per kilometer was included in the concession. The track was not to exceed 200 kilometers (124 miles) in length.

Under Mr. Larned's management only 5 kilometers were constructed and the concession was declared forfeited for non-compliance with its conditions.

In 1882 the Mexican Government made a contract with private individuals for the completion of the Tehuantepec line, and in January, 1883, the track was finished from the mouth of the Coatzacoalcos River to Minatitlan, a distance of 25 miles. The route of the projected railway is about 170 miles in length.

The line runs due north and south, and will traverse the southern portions of the States of Vera Cruz and Oaxaca. The adjacent country may be described as follows:

The depth of the water at low tide is 13 feet on the bar at the mouth of the Coatzacoalcos River, which is navigable for a distance of 30 miles. Placer gold deposits are said to exist in the interior of the isthmus, although the country has not been yet geologically explored. Large beds of asphalt also occur. The vegetable productions of this region are indigo, tobacco, sugar-cane, cocoa, cotton, coffee, Indian corn, vanilla, sarsaparilla, ginger, and India rubber. The terminus of the road will be at Salina Cruz, 3 miles west of La Ventosa, on the Pacific coast, which is considered a safe harbor.

A telegram from the City of Mexico dated February 12 says that work on this road is making good progress, with over 2,000 men employed. Up to date 47 kilometers (29 miles) are completed from Coatzacoalcos on the Gulf and 80 kilometers (49.6 miles) on the Salina Cruz or Pacific end. The great provisional bridge, 1,250 feet long, over the Tehuantepec River is finished. It will eventually be replaced by a more solid structure.

Cardenas Railway.—From Villa de Cardenas to El Ingenio, on the left bank of the Grijalva River, in the State of Tabasco. Completed 4 miles.

A company has secured a subscription of $2,500,000 in London to its first preference stock to build a line from Tonala to a point on the Grijalva River, thus making an interoceanic line. Surveys are now being made westward on the Pacific Coast from Tonala; a portion of the line to the eastward has already been located.

Ferro Carril de Hidalgo, from Irolo to Pachuca, 37 miles with branches from Teoloyucan to Tizayuce, 15 miles, and from Tepa to Santa Maria, 9 miles, total 61 miles and siding 2 miles. Gauge 3 feet.

Ferro Carril de Monterey y Golfo, projected from Monterey to Tampico, about 400 miles, 25 miles opened April 24, 1889, 100 miles to be completed July 1, 1889, the remainder to be built as rapidly as possible. A recent report says that track is laid 78.2 miles southeast of Monterey, and the branch line running northwestly to Venadito is being completed at the rate of 2 miles a day.

Ferro Carril Nacional de Tehuacan a' Esperanza.—Chartered September, 1877. Construction begun July 1, 1878, completed and opened January, 1880. This road was built chiefly to carry the products of the country through which it passes. It is worked by mule power, the use of locomotives being very expensive and considered im practicable. Length of line 31 miles. Gauge 4 feet 8½ inches. Total cost of road $350,000. Operating cost 65 per cent. of gross earnings. A concession has been granted to extend it 49.6 miles south of Esperanza.

Matamoros and Matehuala.—It is stated that this road will soon be under construction. It is to run from Tamaulipas via Villa de Mendez, Cruilla, Burgos, San Nicolas, Villagrau, Hidalgo, Victoria, Linares, to Matehuala. The country through which it passes is rich in minerals and timber and is capable of producing large crops of cotton, sugar and tropical fruits.

Sinaloa and Durango Railway.—A concession was granted to Mr. Robert R. Symon and associates for the construction of a railway from the Port of Altata to Durango via Culiacan and Casala, with a branch to run down the coast from Culiacan (population 10,000) to Mazatlan.

This road is completed to Culiacan, 38.5 miles The company's charter was amended in 1888, authorizing the construction of a road from Mazatlan to Guaymas, and promising a subsidy of $8,000 per kilometer, payable in 6 per cent. bonds. The cost of the completed portion was $1,102,269, of the equipment, $54,577.

Michoacan and Pacific.—This road was opened for traffic from Maravatio to Angangeo, 27.9 miles, on January 1, 1890, and will be opened to Las Trojes, 3 miles further, by March 1. The construction is to be continued towards Ignala.

Nautla and San Marcos Railway.—Authorized from bar of Nautla, on the gulf between Vera Cruz and Tuxpan to San Marcos, on the Mexican Railway, 111 miles. Four miles have been completed of standard gauge. The concession, dated June 25, 1881, granted a subsidy of $9,660 per mile.

Puebla and Izucar de Matamoros Railroad.—From Puebla to Izucar, 37 miles, of narrow-gauge. The concession, dated May 6, 1878, granted a subsidy of $12,880 per mile, or $480,000 in all.

Vera Cruz, Anton Lizardo and Alvarado Railway.—From Vera Cruz to Alvarado, 34 miles. The concession granted March 26, 1878, carried a subsidy of $12,880 per mile; an extension having been authorized from the San Juan River to the Isthmus of Tehuantepec, 84 miles, makes this amount to $1,520,000 in all.

The following concessions are said to have been granted and are likely to be carried out, either wholly or in part:

(1) For a road from Deming, N. Mex., southward via Asuncion, Corralitos, Casas Grandes, El Valle, and Santa Ana to Guerrero, east to Chihuahua and west to Guaymas Bay and Topolobampo. Surveys are being made along the route.

(2) For a line from Matamoros to San Luis Potosi, to be of standard gauge and with a subvention of $8,000 per kilo.

(3) From Matamoros to Bagdad.

(4) To Gonzales Esteva for a line from Chamela, on the Pacific, to Aguas Caliente, and Guadalajara. The States of Jalisco and Aguas Calientes have granted subsidies of $2,000 and $3,000 per mile, respectively.

(5) To General Felipe Camacho for a line from Tula via Pachuca and Enlancingo to Zacualtipan with authority to extend the line to Tampico or Tuxpan. The surveys are to begin at once, the construction within a year, and the line is to be completed within four years. A subsidy of $9,000 per mile was given. Work has already begun and about 14 miles are nearly completed.

General Palmer, president of the National road, says that the introduction of railroads has increased the revenues of the Government from eighteen to thirty-one millions a year. It is clear that railroads are going to have a profitable corner here, but it will have to be on a reasonable business basis. When the railroad people conclude to reckon their subsidies as uncertain, for the present at least, and to count simply on the earning capacity of their property, they will be on a solid basis and in time a profitable one, too.

The expenses of railroading in this hot climate are great. Wooden ties have but a short life, cracking in the dry season and rotting during the rainy months; bridge timber and piles also wear out rapidly. Freight cars must be painted frequently to prevent drying and cracking, and even the substantial Pullman cars shrink under this exposure. Fuel constitutes a large item of outlay. Mesquit roots are burned on the Central road, pine cut along its route is used on the Interoceanic, and the Vera Cruz Company feed their engines coal blocks brought from Wales as ballast. The decay of ties will in time necessitate a serious outlay on the Central road, for wooden

sleepers cost here $1 each. It is evident that iron ties are a necessity in Mexico, and they are just coming into use. The climate tends to preserve the rails and iron bridges, provided the latter escape the torrents of the rainy season. The grades on the railroads are somewhat heroic, and the task of constructing road beds in this mountainous region is often gigantic.*

RAILROADS IN YUCATAN.

Ferrocarril de Merida á Progreso, from Merida to Progreso, 24 miles. Federal subsidy, $9,660 per mile. Total cost, $800,000. Construction begun, July, 1873. The road was opened September 12, 1882. Gauge, 4 feet 9 inches. Soluta branch from Merida to Soluta, 30 miles.

Ferrocarril de Merida á Peto, from Merida to Tiscal, 43.4 miles projected to Peto, 100 miles in all. Concession was granted by the federal government to the governor of Yucatan March 27, 1878. After 2.5 miles had been built it was transferred to R. and O. G. Canton. The completed portion was opened May 5, 1885. It has a subsidy of $8,344 per mile. Gauge, 3 feet.

Ferrocarril de Merida á Calkini, from Merida to Chochola, 21 miles; projected to Calkini, 102 miles. Completed portion opened August 2, 1884; the remainder is under construction. Concession dated September 14, 1880, with subsidy of $8,344 per mile. Gauge, 3 feet.

Ferrocarril de Campeche á Calkini, projected from Campeche to Calkini, 52 miles. Completed branches from Campeche to Pomuch, 39 miles, and from Campeche to Lerma, 6 miles. The main line is under construction. Gauge, 3 feet. Concession is dated February 23, 1881, and gives a subsidy of $9,660 per mile. Sole owner, José Mendez Estrada, who issued to the State of Campeche fifty shares of stock of $1,000 each in consideration of the concession.

Ferrocarril de Merida á Vallidolid, projected from Merida to Valladolid, 106 miles, of which 22 miles from Merida to Motul City, were completed and opened July 22, 1888, the remainder is under construction branch from Conkal to Progreso, 19 miles, completed. Another branch is projected from Cenotilla to Tizimin, 37.7 miles. Gauge, 3 feet. Concession dated December 15, 1880, with a subsidy of $8,344 per mile.

The following concessions have been granted:

(1) For a line from Cancel to Progreso, without a money subsidy, the road to be finished in five years.

(2) For a line from Izamal to Chan Santa Cruz. An extension to be built from Tekanto to Izamal.

One of the best built railroads in Yucatan is that owned by the brothers Rudolfo and Olegario G. Canton, and named the Merida and Peto Railroad, and, as it may be considered a typical road of Yucatan, a general description of it may be of use.

Its concession was consummated May 27, 1878, and the first rail laid a year later. The road is of 3 feet gauge, well built, and ballasted for the most part. The rails are of Bessemer steel (purchased in England), weighing 40 pounds to the yard, and resting upon sleepers of "Chu cum," a very hard wood, as hard and heavy as lignum vitæ. These ties, or sleepers, are placed 2 feet apart, fifteen to the rail length. The locomotives are four in number, all purchased in the United States. Five passenger-cars are now in use. Twenty-two box and platform cars carry the bulk of the traffic.

Upon the line of the 68 kilometers (42 miles) now in actual operation there are eight suitable and thrifty looking stations, built of stone and mortar, well cared for, and very neat in appearance.

The cost of constructing a road-bed in Yucatan is materially lessened by the level land surface. I know of but one natural depression necessitating a fill of over 25 feet upon any of the five railroads in Yucatan. The rocky plane that for the most part covers the populated portion of Yucatan is of recent formation, being of soft, calcareous rock, and in traversing it the road builders sometimes find themselves literally breaking through, the percolating waters and other causes combining to form caves or "cenotes" of varying magnitude, and covered with a crust of various degrees of thickness and strength.

The above-described Merida and Peto Railroad has just had to grapple with and

* "Mexico of To-day," by S. B. Griffin, 1886.

overcome a difficulty of this nature. While cutting the road through a small hill near the station of Hunabchen a blast suddenly opened the mouth of a gulf beneath, which luckily proved to be comparatively small and shallow, and with much labor was filled sufficiently to allow the work to proceed.

I have collated the following data concerning the railroads of Yucatan. The amount expended can, of course, be considered as only approximately correct. Various reasons make it an impossibility to obtain the exact figures in dollars and cents.* (Report by Edward H. Thompson, U. S. Consul, Merida, Yucatan, February 15, 1888.)

THE COAL-MEASURES OF COAHUILA.

As the Republic of Mexico is generally regarded as barren in coal-measures of commercial worth, a statement of what has actually been accomplished in the past three years in proving the existence of extensive coal areas and in their development in a portion of the state of Coahuila will be of value.

The region of country bordering the Rio Grande River, from above Eagle Pass to below Laredo, Tex., and extending westerly and southerly over 100 miles in the State of Coahuila, belongs geologically to the cretaceous period. In the Rio Grande region the coal-measures, as seen in the hills around Eagle Pass, Tex., and at Laredo, belong to the "Fox Hills group" in the classification of geologists.

This Rio Grande coal belongs to the class of cannels or semi-cannel coals. Cannel coals are valuable for household and general use as fuel, either for heat or steam production, and also for the manufacture of gas or the distillation of oil, but are valueless for manufacture of coke.

The Sabinas coal, as the Coahuila coal is called, on the other hand, is a highly bituminous coal, yielding by analysis from 60 to 70 per cent. carbon, and produces an excellent grade of coke admirably adapted to all smelting purposes, whether of iron or the ores of the precious metals.

The extent of the coal areas in the State of Coahuila is not yet definitely determined, and hence this report will be limited to a general description of the coal areas that have been explored and are now being actually developed by the companies representing American capital, the Coahuila Coal Company and the Alamo Coal Company. These companies jointly own about 51 square leagues of territory, or about 220,646 English acres. This immense area is traversed by the track of the Mexican International Railway, and embraces a large portion of the valleys of the Sabinas and Salado Rivers.

Sabinas station, on the Mexican International, is 73 miles from the Rio Grande River at Piedras Negras, and has an altitude above sea-level of 1,116 feet.

From Sabinas there is a standard-gauge railroad 13 miles to the coal mines at San Felipe and Hondo, where the coal companies have their main works. Here are offices, store-houses, miners' quarters, mining machinery, and all appliances for mining and shipping coal in large quantities. Explorations over this large area by prospecting shafts and the diamond drill have conclusively demonstrated that two, and perhaps three, coal horizons underlie this territory. The uppermost in the geological series of these coal formations is known as the "Laramie group," and the one that belongs immediately beneath it is the Fox Hills group.

The Laramie and Fox Hills groups are well-known coal-bearing formations in Colorado, Utah, and Wyoming.

In Coahuila coal formations the same conditions are found to exist as in all other western coal formations.

The entire region appears to have been disturbed by some convulsion of nature, so much so that the coal horizons, instead of lying in horizontal planes, can be more accurately compared to an undulating inclined plane. The disturbing cause or force seems to have been exerted along a path from south-southwest to north-northeast, leaving the ridges and depressions running nearly west-northwest and east-southeast, and hence at many points the strata have been greatly disturbed and broken up and faults occur in the continuity of the coal-bed.

At some points the strata are nearly horizontal and in close proximity; have changed to an inclination of from 30 degrees to 40 degrees. Other peculiarities of the formation were caused, probably, by forces at work simultaneously with the deposition of the coal material. The district was doubtless acted upon by swift currents of water that washed away portions of the vegetable material (basis of future coal) and clays were deposited in its stead.

Subsequently other coal material was deposited over the clays, and clays in process of time changed to argillaceous shales. These shales, representing what coal miners call a "horse," where no subsequent deposit of coal material was laid down, only a thin scale of coal will be found. Hence coal mining in the western coal

* The table has not been copied.—G. A. Z.

formations in Utah, Colorado, and Wyoming, in the United States, and here in Coahuila, is subject to about the same conditions, viz., varying thickness of the coal-beds, even within short distances, and to greater or less variation in the quality of the coal within equally circumscribed limits. The variation in thickness may extend even to an entire absence of coal from certain portions of the bed, and variation in quality may range from fine coal to merely carbonaceous shale. These varying conditions in thickness and quality necessitate careful explorations with the diamond prospecting drill. This has been very exhaustively performed over large areas by the coal companies established at San Felipe and Hondo.

The Laramie strata can be traced along the north side of the Sabinas Valley, a distance of nearly 40 miles, beginning a few miles above Sabinas station of the Mexican International Railroad and extending southward down the valley.

On the south side of the River Sabinas, some 20 miles from Sabinas station, coal croppings are found in strata equivalent to the Fox Hills group.

As coal of either the Laramie or Fox Hills age, or both, is well known to exist in Colorado and New Mexico along the eastern slopes of the mountains, it is evident that there is a belt of these two coal-bearing formations extending nearly or quite continuously from the valley of the South Platte in Colorado to the State of Nuevo Leon, Mexico. The coal at Sabinas is the only coal found anywhere in northern Mexico suitable for iron smelting and kindred metallurgical processes.

At many points on the Sabinas River thick beds of argillaceous shales occur, mixed with alternate layers of iron-stone. This iron-stone, it is believed, will some day prove of immense value for manufacture of pig-iron.

The argillaceous iron-stone of the Sabinas region, the mountains of magnetic iron ore in the neighborhood of Monclova, and the limestone found all over the country, in connection with the Sabinas coal and coke, comprise all the materials and requisites for the manufacture of iron.

The extension of the Mexican International Railroad to Durango will bring Sabinas coal and coke to the famous iron mountain of Durango.

When one considers that save at the Sabinas coal mines no coal is anywhere mined in all the territory of Mexico, and bearing in mind, too, the equally important fact that Sabinas coal produces a fine grade of coke, the immense value of these coal mines, now producing over 8,000 tons of coal per month, to Mexico is apparent. This coal is sold to the Mexican International and Mexican Central Railways, shipped to the City of Mexico, and about 3,000 tons monthly is exported to the United States at Piedras Negras for the Southern Pacific Railway.

The development of iron manufacture, that is, producing pig-iron from iron ores, and of the thousand attendant industries, will be of incalculable benefit to Mexico, as at present Mexico purchases all her iron and iron manufactures.

It is quite possible that the full development of the iron industries of Mexico, now for the first time made possible, or even probable, by the demonstrated fact that coal yielding an excellent coke exists in inexhaustible quantity in the Sabinas region, will prove of greater value to Mexico, will contribute more to the real comfort and well-being of her people, and add more to the real greatness and wealth of the Mexican nation than have her immense resources in the precious metals.

So to-day in the United States the united industries of coal and iron add more to the national wealth, strength, and prosperity than does the total yield, immense as it is, of our mines of the precious metals. (Report by Eugene O. Fechét, U. S. consul, Piedras Negras, December 6, 1889.)

CENTRAL AMERICA.

The present independent Republics of Guatemala, San Salvador, Honduras, Nicaragua, and Costa Rica constitute what is known as Central America—a territory extending between 8° 10′ and 19° 20′ north latitude, and between 82° 25′ and 92° 30′ west longitude. In length it measures between 800 and 900 miles, while its breadth varies from 30 to 300 miles. No competent survey has ever been made of this country, and even the coast line is not always correctly laid down on the best charts. Maps have been made at haphazard in most cases, and very few positions have been successfully determined. Government surveys along the lines of proposed canals or railways have not extended beyond a narrow line, usually in low regions remote from important centers. Dr. Franzius has published a very excellent map of Costa Rica; but most of the so-called maps published by or under the authoriy of individual republics are of no scientific value, the course of the principal rivers and the direction of the main mountain chains being unknown. To illustrate the uncertain geography of Central America, let me give the extent and population, as published by three authorities: I. Lippincott's Gazetteer; II. Whittaker's Almanac, and III. the "Geografía de Centro América" of Dr. Gonzalez:

States.	I.		II.		III.	
	Square miles.	Population.	Square miles.	Population.	Square miles.	Population.
Guatemala	40,777	1,190,754	40,776	1,500,000	50,600	1,200,000
Salvador	7,355	434,520	7,335	554,000	9,600	600,000
Honduras	47,090	351,700	39,600	300,000	40,000	400,000
Nicaragua	58,000	263,000	58,170	300,000	40,000	275,816
Costa Rica	21,495	180,000	26,040	200,000	21,000	200,000
	174,697	2,392,974	171,921	2,854,000	161,200	2,675,816

Without surveys and without a proper census of the Indian tribes no scientific description of the country can be given. Humboldt's theory of an Andean cordillera has been disputed, and his mountain chain has proved to be a confusing (but not confused) series of mountain chains.

* * * * * * *

Whatever has been the process by which this essentially mountainous country has been formed, we have at present at its northern boundary the high plain of Anahuac, extending from Mexico (where it is interrupted by the Isthmus of Tehauntepec) through Guatemala; of somewhat lower level in Honduras and Salvador, sinking to almost sea level in Nicaragua (154 feet); and rising again in the Altos of Veragua to about 3,250 feet. This main range has its axis much nearer the Pacific shore and almost parallel to it, being in Salvador, distant 75 miles, and in Guatemala (Totonicapan), only 50. Towards the Pacific the slope is steep, interrupted by many volcanoes; while on the Atlantic side the gently terraced incline is broken into subsidiary ridges extending to the very shores. In the oceanic valleys and along the coast are the only lowlands of Central America.*

Among the important rivers of Central America are the Usumacinta, which flows into the Gulf of Mexico, and is navigable many miles through a singularly fertile country. The swift Chixos, the Rio de la Pasion, and the almost unknown San Pedro, unite to form this "child of many waters."

* "Gautemala," by W. T. Brigham, 1887.

The Rio Polochic and Motagua in Guatemala, the Segovia, Rio Grande, San Juan, etc., flow into the Caribbean Sea. Those flowing into the Pacific are short in length, except perhaps the Lempa in Salvador.

Of the lakes, the most important are Nicaragua and Managua, Izabal and Peten, 500 feet above sea-level, Atitlan (5,110 feet), Amatitlan (3,890 feet), Cartina, Laguna de la Cuba, and Lago de Guija.

The country in general is divided into three zones: the hot, the temperate, and the cold. The *first* is along the coast, extending to about 3,000 feet in height; the *temperate*, that of all the plateaus between 3,000 and 6,000 feet, contains the greater portion of the population; and the *cold*, above the latter height.

The seasons are two: the wet extending from May to November, and the dry during the remainder of the year. The range of temperature throughout the year is not over 17 degrees. On the Pacific side there is less rain than on the Atlantic, but the streams become torrents everywhere during the rainy season. The climate, except along the coast, is healthful, and the soil is rich in all tropical productions. The precious metals are found in abundance and many other ores occur. All our sugar, coffee, chocolate, rice, India rubber, etc., should come from Central America.

GUATEMALA.

The largest part of Guatemala consists of an elevated table-land, a continuation of the plateau of Yucatan, and whose mean altitude is about 5,000 feet. The climate of the elevated region is very agreeable; along the coast it is hot and moist.

This State is very rich in resources, which as yet have been little developed; gold, silver, coal, iron, lead, and marble are found. There are upwards of one hundred kinds of timber trees. Other products are coffee, cochineal, maize, frijoles, rice, wheat, indigo, cocoa, sarsaparilla, tobacco, sugar, vanilla, chile, and many fruits.

The rain-fall on the coast is about 150 inches during the rainy season.

Santo Tomas is one of the best ports of Central America, affording anchorage close to shore for large ships.

An excellent idea of the topography of this country can be obtained from the map in the report of the French expedition of 1868. The table-land is intersected by deep valleys running in various directions.

The greater population is on the table-land, because the coast is so unhealthy. The entire population is about 1,400,000, of which 59,039 are in the city of Guatemala, 20,000 in Antigua, 25,000 in Quezaltenango, etc.

Guatemala has a good system of roads; stages ply between Guatemala City, Antigua, and Quezaltenango, but travel across the country from east to west must be carried on by saddle.

The coal, which is bituminous and very rich, is found in the department of Izabal.

RAILWAYS.

Champerico and Northern, from Champerico to Retalhuleu, 27 miles, opened July, 1883, projected to San Felipe, 16 miles farther. It has recently been purchased by native capitalists. The total amount of coffee moved by this road in the year ending June 30, 1887, was 16,873 tons. The imports carried were 3,015 tons. In volume 27, Consular Reports, United States, page 262, will be found a complete description of this road. The gauge is 3 feet, with maximum grades of 3 per cent. and minimum curvature of 4 degrees.

Ferro-carril del Norte de Guatemala, projected from Puerto Barrios to Guatemala City, 185 miles; 4 miles were constructed from Santo Tomas in 1883. The Guatemalan Government has recently entered into a contract with M. Henri Louis Felix Cottu for a loan of $21,312,500, for the construction of a railway from Guatemala City to Santo Tomas, about 185 miles, and agreement on the part of Mr. Cottu to transfer the Guatemala Central Railroad to the Republic of Guatemala. This contract also calls for

the building of a wharf at Santo Tomas; the total cost of road and wharf is fixed at $10,000,000. Surveys are to be commenced in six months, and the construction in one year. A copy of the contract is issued by the Bureau of Statistics, State Department.

Guatemala Central, from San José to Guatemala City, 71.8 miles. Gauge, 1 meter; maximum grade, 4½ per cent. This line is subsidized by the Guatemalan Government to the extent of $100,000 per annum for twenty-five years. The completed road was opened in September, 1884. It is thoroughly built and well ballasted. The cross-ties are partly native wood and partly California redwood.

A branch to La Antigua is projected. The total cost of the completed line was $2,500,000. The highest elevation reached is 5,010 feet.

It is reported that this road has recently been purchased by American capitalists, along with the franchise previously obtained by Mr. Cottu.

Surveys are in progress for a railway to run from Guatemala City to a connection with the Mexican Pacific Railroad at the Mexican border.

The railroad system of Guatemala includes two short lines of track—one of them reaching from San José, the principal Pacific port, to the capital, 72 miles, and the other from Champerico, a few leagues northward, to the coffee plantations of the interior, about 22 miles. Both are useful factors in the development of the country; but more important to the commercial interests of the United States is the proposed line which is intended to connect Port Barrios, on the Caribbean Sea, with the capital and the Pacific, thus shortening the transportation distance from Guatemala to the trade centers of our own country by several thousand miles. This railroad has been contemplated for many years, and a liberal concession was made by the Government to citizens of the United States for its construction; but the grantees after several extensions of their privilege, have finally abandoned the project, and the Government is doing a small amount of work upon it without much encouragement for its completion. Labor is scarce on the Atlantic side of the continent and the climate is very severe; few laborers being able to endure the miasm which constantly arises from the jungles along the coast. Last fall several ship-loads of white and colored laborers were imported from New Orleans to do the grading, but the experiment was disastrous, resulting in a frightful amount of disease and mortality, so that the United States consul-general was obliged to appeal to the Government for a naval vessel to carry the sick back to their homes. But the present engineer-in-chief states that a recent acquisition of negroes experienced in railroad building has been found very efficient and the laborers have very good health. The importance of the line to American commerce leads to the hope that all obstacles to its speedy completion will be removed.

The country along the Atlantic coast is rich in tropical vegetation, and would be rapidly developed if means of transportation were afforded; but the difficulties already encountered make the outlook somewhat discouraging.

The railroad from San José to Guatemala City has been in progress of construction for five years; the concession being originally granted to a native by whom it was transferred to General Butterfield, of New York. The latter completed the line as far as Escuintla, a town 25 miles from the coast, which has long been the center of a large, thickly settled and finely cultivated area, producing valuable crops of coffee, sugar, cocoa, cotton, and other tropical products. There are 500 miles of wagon-roads reaching Escuintla, and the town has always been a market of great importance.

General Butterfield abandoned the railroad at this point, when its completion was undertaken by a syndicate of capitalists from the Pacific coast, who laid the last rail and opened it to commerce in August, 1884. Although constructed through a mountainous country, with an average grade of 4 per cent., the road will compare well with any narrow-gauge line in the world, and is probably the best in Central America. It is laid with steel rails upon hard-wood ties, many of which were imported; is firmly ballasted, and its many bridges were constructed with regard to permanence and safety. The equipment of the road appears to be amply sufficient, its station-houses are commodious structures built upon modern plans; its management is courteous, liberal, and enterprising, and this institution, most important to the commercial welfare of Guatemala, is in all respects a credit to the Republic and the citizens of California, whose energy and capital carried it through. By giving as low rates of freight as the cost of construction will permit, and by a studious regard for the interests of their shippers the managers of this road have done much to facilitate commerce and cheapen the cost of imported goods.

The other railroad from Champerico to Retalhuleu has brought life in a similar manner to a valuable section of the country, and has very largely increased the productive area of the department through which it runs. This road was also constructed by the citizens of the United States and has proved remunerative to its own-

ers. The port of Champerico has the largest export of coffee in Central America, but the importation at San José is greatly in excess.

It is a plan to extend the Champerico Railroad farther into the interior, and a few years will probably see it done. In this connection it may be stated that the extension of the Mexican system of roads into Central America is by no means a difficult or impracticable scheme. The commission has taken pains to secure the information of the character of the country to be traversed, the difficulties and expenses of construction, the probable result such a road would bring to commerce, and is strongly of the opinion that such an undertaking, even if it were carried as far as the Isthmus of Panama, would result in ultimate benefit, not only to the communities through which it would pass, but to the commercial interests of the United States. (Report of South American Commission, page 182.)

First, we discussed a road from Livingston to Coban, to open the coffee region; and as we were fresh from the very route, we tackled the problem unhesitatingly. The road, we decided, should run up the coast towards Cocali, turn through the forest 6 miles to Chocon, crossing the Chocon River on a single span, then over the smaller Rio Cienega and along the north shore of the Lago de Izabal, then a little to the northward of the Rio Polochic, bridging the Cahabon near the limestone ledges east of Pansa, thence through Teleman, and by nearly the cart-road route to Coban. Perhaps 125 or 130 miles in all, of single track, would result in quadrupling the coffee export of Guatemala. It would then be profitable to raise more of the delicious oranges of Teleman, oranges such as Florida can never raise; the mahogany of the Cienega and Chocon could be marketed; and all Alta Verapaz be a plantation of coffee and fruits. More than this, the road would pay from the first through train. Before us on the west coast was the sugar and cacao region—that land that produces the royal chocolate, which outside barbarians never get, but which might be raised very extensively from Soconusco eastward if a railroad should be built over the level lands from Escuintla to Retalhuleu, and Ocós. A road from Guatemala City through Salamá to Coban would not only open the rich sugar estate of San Geronimo, but connect the capital with the Mexican system, which will probably go to Coban eventually. At Belize the English are trying to build a road inland to Peten to open the logwood and mahogany forests, and they need a road along the coast to open the settlements that now have no outlet save by water. A hundred and forty miles at the outside would connect Belize with Livingston. The roads in Honduras will extend between Trujillo and Puerto Barrios, there connecting with the Northern Railroad of Guatemala. Not one of these projected lines presents any very difficult engineering problems. The financial question is the only obstacle; and with the exception of the first two—both coast roads, and of simple construction—they would not pay for a few years. (Brigham's Guatemala, page 168.)

HONDURAS.*

This is the third Republic of Central America, and its resources are almost wholly undeveloped. The vast plains of Comayagua and Olancho are covered with excellent grass, and pasture large herds of cattle. The forests, which occupy much of the Atlantic coast region and the lower mountain slopes, abound in mahogany, rosewood, cedar, etc. In mineral wealth Honduras easily outranks all her sister Republics. Silver ores are exceedingly abundant, chiefly on the Pacific slopes. Gold washings occur in Olancho, antimony, tin, and zinc have been reported.

Of the cities one of the most important is Tegucigalpa, the capital, in the midst of a plain 3,000 feet above the sea and surrounded by a mining region. Its population is about 12,000. The population of Comayagua is 10,000.

Puerto Cortes has a good port, and the Gulf of Fonseca is an excellent harbor, the finest on the Pacific coast of Central America.

RAILWAYS IN HONDURAS.

A narrow-gauge railway extends from Puerto Cortes to San Pedro Sula, 69 miles, but is operated only to St. Jago, 37 miles, the remaining 32 miles being useless, because of the destruction of an iron bridge over the Chamelicon River. It was originally projected to the Gulf of Fonseca (Amapala), under the name of the *Honduras*

* The land laws of Honduras are given in the Consular Reports of United States, No. 105, page 158.

Railway, and was to be about 200 miles long, with a maximum elevation near the center of 2,850 feet. The present line has a traffic of about $1,250 a month.

The *Honduras Central* is projected from Truxillo to Jutecalpa, 200 miles, and thence to the Gulf of Fonseca. The concession is owned by a New York syndicate.

In July, 1884, the *Honduras North Coast Railway and Improvement Company* received a concession accompanied by a land grant, estimated at 1,000,000 acres, for a line from Truxillo to Puerto Cortes, about 150 miles, with power to extend to the Guatemala boundary line. The gauge is 3 feet; the construction began July 8, 1885.

The *Truxillo and Roman River Railway* is projected from Truxillo to Roman River, 20 miles, with power to extend up the Arenal Valley.

HONDURAS INTEROCEANIC RAILWAY.

One of the great questions of the time is that of effecting interoceanic communication across the American Isthmus, and thus opening to the world the most important highway for the trade and commerce of all countries. This vast problem has not only occupied the attention of our time, but it has also occupied the attention of the past. King Philip II, of Spain, with all the wealth of the Indies at his command, sought, but failed, to accomplish this great work; and its importance to the world was known and discussed long before that early period.

One of the possibly practical solutions of the great problem is, it seems, about to be undertaken by the construction of a railway across the Republic of Honduras, from Puerto Cortes on the Atlantic to Amapala on the Pacific. An English syndicate during last year obtained a concession to build this interoceanic railroad, and organized in London with the title, capital, conditions, and objects, so succinctly set forth in the following notice published in the Financial News, of London:

"*Honduras Railway Company, limited.*—Registered by Johnson, Budd & Johnson, 100 Winchester House, E. C. The capital of the company is £8,000,000, divided into 200,000 shares of £12 each, and 72,000 shares of £50 each, which are created to enable effect to be given to clause 3 of the memorandum of association, and into 20,000 of £100, with power to issue any of the 20,000 shares of £100 each, and any new shares upon such terms as to preference or otherwise, as the company in general meeting may direct. The objects for which the company is established are to acquire, complete, construct, maintain, and work a railway or railways across the territory of Honduras, from Puerto Cortes, on the Atlantic, to some point in the Gulf of Fonseca on the Pacific, and all or any modification of those works, and all such railways or other works as may be authorized by any concession or decree of the Republic of Honduras authorizing the execution of any railway, or railways, or public work in the said Republic, and to develop traffic or operations thereon or in connection therewith; to acquire the concession or any interest in the concession for the said railway or railways, or any other concession or concessions for railways or public works in the Republic of Honduras which the company may decide to acquire, and to accept any liability; to offer to the holders of bonds of the Republic of Honduras ordinary shares of the company, fully paid up, in exchange for and against delivery and transfer to the company of such bonds, and also to purchase and otherwise acquire any railways or other works in Honduras which shall at the time of such purchase or acquisition have been wholly or partially constructed; to acquire, complete, construct, maintain, and work any roads or lines of telegraphs, docks, wharves, quays, jetties, warehouses, telegraphs, buildings, or operations of navigation or mining, or other operations authorized or demanded by any such concession or concessions as aforesaid, or which it shall be deemed advantageous or convenient to establish or work in connection with what shall be so authorized or demanded, and generally to do such acts and things, the doing of which shall be within the scope or be deemed calculated to develop the advantages of any such concession or concessions."

This venture had so faltered and wavered and even failed, until the stipulated time had expired, that it engendered a general belief that the concession, like many others, would prove a fiasco. But extension of time was obtained, and the syndicate sent a corps of engineers to make examinations, which are now concluded; and the chief of engineers, Mr. Lee Smith, remained here at the capital until last month arranging with the Government, to his satisfaction, some minor details, and he is now going away, leaving the assurance that the road will be completed within three years.

What a pity this great work will not owe its completion, as it does its design, to American genius and enterprise. If our people are to lose by failing to grasp the importance of the enterprise, it is not the fault of their Government or representatives here, for all necessary information thereon was given years ago by Mr. E. G. Squiers, who was then our chargé d'affaires in Honduras, and who designed this road and

published to the world its superior advantages over all others for a transisthmian railway. In addition to the foregoing published and public facts, I have done my best to draw the attention of our railroad capitalists to the urgent need of transportation facilities in this country and to profits from investments for railroads. Mr. Squiers has perhaps given this subject more study and investigation than any other person, and he estimated the cost of the road to be not necessarily more than $7,000,000, and that the road would pay for itself within the first four years If this is anything near the truth, some of our capitalists will regret that they have let the opportunity slip of building this road, as it would not only have increased their fortunes, but would have gained them the title of public benefactors and the gratitude of the people of this Republic, where the want of railroad enterprise is so severely felt and the help of capitalists so much needed and sought.

When it is considered how this important question of interoceanic communication has been so long and continuously agitated, it is not a little surprising that there has never yet been but one way actually constructed, and that the little railroad crossing at Panama, and especially since the advantages of the Honduras route have been made so clearly evident. The Panama road cost twice as much per mile as Squiers's estimate of the cost per mile of the Honduras road, and yet it is certain that the Panama road has yielded rich returns for the capital invested. The Honduras route will be not only cheaper in construction, but cheaper in operation. It has better ports, easier facilities for embarkation and debarkation, better sources of supply, a healthier climate, and is shorter in distance and in time between the great commercial centers of the world.

As it is now probable that the road will be built under the aforesaid concession, I herewith forward official copy of the same, but without translation. Its most noteworthy feature is the vast amount of land it grants, thus enabling the syndicate to establish a large British colony in Spanish Honduras, which was done in what is now known as British Honduras, and which resulted in making the latter a dependency of Great Britain. It is not likely that this country can ever be made a dependency of the British Government either as a protegé, as Cromwell so early extended his British protectorate over that part of old Yucatan now known as British Honduras, or as a part of the present colonial system of England. (Report of Consul Herring, Tegucigalpa, November 25, 1888.)

TRANSPORTATION IN HONDURAS.

Progress in Honduras, not only commercially but in every way, is greatly retarded by lack of facilities for transportation. To remedy this difficulty the Government has been carrying on a work designed to give this Republic a complete system of good wagon-roads. The first link in this chain of communication—a broad, smooth road of easy grades—was completed two years ago. It connects Tegucigalpa, a city of about 12,000 inhabitants, with the ports on the Bay of Fonseca, some 90 miles away, and there with the vessels of the Pacific Mail Steam-ship Company, which regularly ply between San Francisco and Panama. This road is of great benefit to the trade of Tegucigalpa, the capital of the Republic, as it affords for the first time within the period of modern history means for comparatively easy and cheap transportation of goods from abroad, and of the produce for which these goods are exchanged. Soon after this road was finished another was constructed, connecting Tegucigalpa with the mining camps of the mineral district of Yuscaran, 45 miles distant. Over this new highway the mining companies have hauled large and heavy castings, which could not have been carried over the old trails at a cost within the bounds of reason. Within the last year another wagon-road has been completed from Tegucigalpa to the rich Rosario mine, at Sanjuancito, a distance of over 20 miles. And, by the way, a telephone line from Sanjuancito, via Tegucigalpa, to San Lorenzo, on the coast, near Amapala, is just finished by the enterprising Americans owning the Rosario mine. Within the last year another wagon-road has been constructed by Capt. F. M. Imboden, an American, who built the two first mentioned. This road extends from Tegucigalpa to the city of Comayagua, which was long the capital of the Republic, and is now, of all towns in the country, only second in size to Tegucigalpa, and is two days' journey away. The intention is to continue this road through the valleys of Comayagua, Espinal, and Sulaco to the terminus of the railroad, at San Pedro Sula, 37 miles south of Puerto Cortes, on the north coast. This road is of the highest importance.

As far back as 1539, when this country was under Spanish rule, the governor of Honduras addressed a letter to the then Emperor of Spain advising the construction of a road over this same way to the Bay of Fonseca and representing that this was the best route that could be obtained for the transportation of goods and persons from Spain to Peru and other points on the Pacific Ocean. Most of the correspondence with people in the United States and Europe, with British Honduras and the West Indies, passes over this route; and many, if not most, of the visitors from the

United States to the seat of government here come by way of this road, through Comayagua. One reason for this is found in the fact that the only steamers making trips regularly, on fixed dates, between the United States and the north coast of Honduras run from New Orleans and Puerto Cortes. Another reason is that this route to the north, via Comayagua and Puerto Cortes, is much cheaper and more direct than is any other between Tegucigalpa and points in the States east of the Mississippi or in Europe. Mail from central cities of the United States, as Chicago, St. Louis, or Cincinnati, reaches Tegucigalpa in sixteen to twenty days if sent by way of New Orleans and Puerto Cortes, while that sent from New York or San Francisco requires from twenty-one to twenty-six for its transmission.

It will be seen that this road to Comayagua forms a link in what will be a chain of roads reaching from Puerto Cortes on the north coast, and only 900 miles from New Orleans, to La Brea on the south, some 1,670 miles south of the latitude of San Francisco. Connected with lateral branches to be made through the large and fertile valleys of the Salaco, of the Chamilicon, and the Santa Barbara Rivers, this system will not only afford comparatively easy and quick communication between Atlantic and Pacific ports, but it will also furnish an outlet for the products of three great valleys and of the countless fertile mesas and hill-sides and valley farms, naturally tributary to the large valleys.

From Comayagua to Puerto Cortes the road follows the lines selected, after careful survey by American engineers, as a route for an interoceanic railway from Puerto Cortes to Fonseca Bay. From Comayagua to Tegucigalpa the road is a departure from the proposed railway route, but it is evident that there would be little difficulty in constructing a railway where a wagon road of easy grades and curves has been made. Hondurancans and Americans having interests in this country are anxious for this railway to be built. The Government has offered most liberal terms to several parties who have proposed to build such a road. Several contracts have been made for that purpose, but so far nothing has been done in its construction since the completion of the short road of 37 miles from Puerto Cortes to San Pedro, and this is yet the only railroad in this country. The greatest obstacle in the way of this much desired interoceanic railroad is a contract that was made for its construction many years ago with an English company who built the 37 miles of road referred to and then abandoned the work, leaving the Government bound for a large debt of bonds issued for the company in the hope that the entire road would be completed under the contract. This railroad debt amounted, with interest, to $32,500,000 in July, 1875, and no part of it has since been paid, and the interest on it has been accumulating at the rate of 10 per cent. per annum. It is believed that this debt is now bought up and held by a few capitalists, principally in London and Paris, and could be compromised or adjusted on very easy terms to be paid at a small per cent. of the face value of the bonds. At any rate, until this obstacle is in some way removed, there seems to be no cause to hope for the construction of this great highway, the advantages of which to Honduras, and, as a transisthmian route, to the whole world, have been clearly made known by Mr. E. G. Squiers, formerly United States chargé d'affaires to Honduras.—(Consul Herring, Tegucigalpa, Honduras, June, 1879.)

MINING INDUSTRY OF HONDURAS.

The interest and activity of gold and silver mining have been rapidly on the increase since the last report on the subject from this consulate. In the twelve months preceding this there have been denounced* under the mining laws more veins than any four years of the past. There is no record yet compiled, nor likely to be for a year, showing the number of mines so denounced, but I am assured by the chief of the mining bureau that this number may be safely put down as not less than one thousand. This shows a notably confidence of this people in the future mineral wealth of their country. The denouncements are mostly made by the natives. Foreigners usually ask for concessions from the supreme Government. At the last report there were not over thirty stamps in operation, now there are over a hundred. Within the last twelve months the Rosario mine, at San Juanito, has declared its first dividend. It is the pioneer of about a dozen of non-active American companies, and is the first and only one of them that has paid a dividend up to date.

Since last report the Government has created a mining bureau, which may be addressed by any one abroad desiring information upon the minerals or mining industry of the country. There has been established an assay office, which is attached to this bureau, and in which are kept for public exhibition and for study and reference a collection of many specimens of geological and mineralogical formations of the country. There are also now a government geologist and an inspector-general of mines. And, furthermore, there is in contemplation a national school of mines, which will perhaps be in operation some time during the coming year. Such facts

* To denounce mines in Honduras means to take up or enter.

show that the Government as well as the people have a growing faith in the mineral resources of the country. Keeping pace with this increasing interest in mineral development, a Honduras mining syndicate was formed at Tegucigalpa in June last for the purpose of buying and selling mineral properties, exploring and working old veins, and discovering new ones.

Although the mining industry as operated under the modern system of improved machinery is but in its infancy in Honduras, yet recent evidences of the power it is destined to wield in the development of this country are seen in mines that have been raised into most valuable properties since its introduction. It is gratifying to add that most, and perhaps all, of such improved machinery comes from the United States, and the increasing demand for the same will doubtless continue to be supplied by the manufacturers of our country.

No doubt what are thought to be the best of the old mines are already taken up, but there are still other good mines that may be denounced under the mining laws, purchased reasonably, or a controlling interest obtained in same by simply placing the necessary machinery upon the grounds. There are also many mines of low-grade ores which can not now be successfully worked, and command but little if any attention, which will be gladly seized upon when transportation facilities become as they should, and, therefore, as they will be, and especially since exceedingly low-grade ores, worth far less than these, can be successfully worked.

Whether these mines are as valuable as those in the United States or not, it may, nevertheless, be safely stated that they are cheaper in proportion to the real richness of the ores. And for this reason, with the increasing facilities for transportation (now so very much needed), the hope is not without its foundation that there is to be a continual and healthy growth of the mining industry in Honduras. Of course, there may be expected the usual failures, resulting from mistakes in the selection of mines, and from mismanagement or dishonesty or both, in the home or foreign office. There are yet old inhabitants, who worked these mines under the Spaniards, who will testify to the rich quality and abundant quantity of the ores. Even one who knows absolutely nothing about mines, mining, or miners, but can weigh properly the credibility of testimony, must conclude that tradition is wholly unreliable, and that history, moreover, has been most unreasonably and unwarrantably falsified, or else these mines are well worth the attention of the capitalists of the world. If the testimony of living witnesses, if the traditions and the written history of the past are worthy of belief, the Spaniards and the Spanish Government have derived immense fortunes and revenues from these same mines of Honduras, and this, too, without the aid of the great improvement in the mining machinery of modern times. But if these mines were so valuable formerly, why is it that they have not produced more bullion and declared more dividends of late years? It is because in the great revolution of 1821, when this people threw off the yoke of Spain and drove its dominions from their borders, there also went with the Spaniards, who left the country, the most of the intelligence and capital that had been directing and was necessary to direct these mining operations. Since then the mines, until lately, have been falling into obscurity.

There was no effort on the part of the Government to advertise its mineral resources. Whether from a fear that the wealth of their mines would attract the cupidity of some other nation that would come and again reduce them to slavery, or from a desire to preserve the mines exclusively for Honduran enterprise, is unnecessary to state. There was, however, as was very natural, a strong prejudice against foreigners. Laws were enacted preventing them from acquiring or holding property. Under these circumstances it is not strange or irreconcilable with the intrinsic value of the mines that they had fallen almost, if not quite, into forgetfulness by enterprising capitalists abroad, especially as the rich mines of the United States, Mexico, and other countries were more fairly and freely open to the competition of the world. Nor is this all. Not only was foreign enterprise excluded from the country, but the natives themselves could not properly work the mines on account of the incessant wars and rumors of wars, even had they otherwise all the necessary means. It is easily understood that without peace, and uninterrupted peace, there can be no such thing as large and successful mining operations. It was only during the administration preceding that of the present chief executive that the prejudicial laws referred to were repealed. But now they have given place to foreigners. Not only have the laws improved towards foreigners, but also the minds and hearts of the people, to the extent that enterprising capitalists from abroad are now more than welcome; they are gladly received, both by the Government and by the people. As peace is prolonged the prospects brighten for the opening up of good roads.

The climate is always both healthy and comfortable in the mining regions. The water supply for mining is abundant, flowing six months of the year; but in the dry season there is a scarcity in some places. By an outlay of the necessary expenses, sometimes considerable, for flumes, etc., water sufficient for work the entire year may be brought to most places where it is needed. Wood is plentiful now, but

the time will likely come when it will be scarce in some of the mineral districts, and unfortunately, there has not yet been discovered sufficient coal or other fuel to take its place. For these reasons it is very necessary, when one wishes to purchase or locate a mine, to have a care, not alone for the richness of the ore, but also the water and their rights, privileges, and facilities.

There is no mining now of any minerals in Honduras except that of gold and silver. At this time Honduras is not the place for prospectors. There is no room here now for either American prospectors or mining tramps. In the first place, because the country is already thoroughly prospected, and even if it were not a poor prospector, single-handed and alone, can not compete with the rich Honduras syndicate before alluded to. And, moreover, though the natives have not the means to work their mines, they are, nevertheless, recognized as good prospectors, and they know the country and the mineral indications peculiar to the country, and they have had very long experience. Although their country may have been neglected or forgotten by capitalists and the outside world they themselves have never lost the best mines of the old Spaniards or ceased to hunt new veins. The native prospector, as well as the common miner, can live well on what an American would think starvation to him. They can live on 10 cents a day as comfortably to them as the average American can live on a dollar a day—ten times as much. Wages are very low. Not even the Chinaman can compete with the natives, and I, therefore, do not know a single Chinese laborer in the whole Republic. When skilled Americans are needed to direct the common labor they are usually contracted with in the States and brought here at the expense of the companies.—(Report by D. W. Herring, U. S. Consul, Tegucigalpa, October 31, 1888.)

SALVADOR.

This is the smallest and most populous of the Central American Republics, there being no less than sixty-three inhabitants to the square mile. The central part is an upland of a mean elevation of 2,000 feet above the sea, bounded on the Pacific slope by a chain of volcanic peaks, beyond which is a strip of lowland from 10 to 20 miles wide. The Gulf of Fonseca, 50 miles long and nearly 30 miles wide, is said to be the most beautiful harbor on the Pacific coast.

Mines of gold, silver, copper, lead, iron, and anthracite coal are found within the borders of Salvador. Some of the principal cities are Santa Ana, 25,000 inhabitants; Salvador, 16,327; Chinandega, San Miguel, etc.

RAILROADS IN SALVADOR.

In 1882 the first railway in the Republic was opened from *Acajutla to Sonsonate*, 15 miles, with 3-foot gauge. The Government guaranties an annual dividend of 12 per cent. This line is to be extended to Amate Marin over a distance of 80¼ miles. Work is progressing on a railroad from Amate Marin to the capital, which will be approximately 25 miles in length.

A line is projected to connect Santa Ana with Acajutla, in aid of which about $300,000 have been subscribed by native capitalists.

Another line is projected from *La Union to San Miguel*, and a company is being organized in London to build it.

A road is projected by the Government from the port of La Libertad to San Salvador.

The *Salvadore Central Railway* is projected from La Union, Gulf of Fonseca, to the Guatemala boundary line. The preliminary work has been completed. The Government has granted a subsidy of $10,000 and guaranties net earnings of $1,000. D. Butterfield is the concessionare.

A tramway 10½ miles in length is in operation between San Salvador and Santa Tecla; it was built by the Government at a cost of $200,000, but has recently been sold to F. Camacho, Guatemala.

In "Capitals of Spanish America," Mr. Curtis says that a road was spoken of to traverse the entire State in the interior valley parallel to the sea-coast, with branches to the important cities, and that the work was not considered either difficult or expensive.

Of these great highways of modern civilization there are but 35 miles in actual operation, with a few more in process of immediate construction and many more in the contemplation of the Government. This little line of road leading in the direction of the capital runs out from Acajutla, the extreme southwestern sea-port of Salvador to the village of Atios. This point has but recently been reached and a depot established.

Although there have been many concessions or grants made by the Government to parties to construct railroads through sections of its territory, it seems that the peculiarly-rugged topography of the country has hitherto interposed insuperable obstacles to the consummation of their plans and purposes. The Government, however, being the proprietor of a section of this road and of a large interest in that over which it does not exercise exclusive supervision with the reserved right to purchase at will, appreciating the needs of its people and the advantages of the prompt and rapid interchange of products and commodities, has set to work on its own account to extend this line of road to the capital, and the work is being executed under the supervision and direction of an enterprising American, Mr. Brannon.

It is contemplated by the Government to extend this road, when circumstances favor, through its entire length of territory, making La Union, which is one of the finest harbors on the Pacific, at the base of the great mineral district of San Miguel, its other terminus. In the meanwhile the road will have traversed one of the richest mining and agricultural districts (now almost unexplored) in all Central America. When this work shall have been accomplished, in connection with the prospective construction of the Nicaragua Canal, a new era will dawn upon this corner of the Western Hemisphere. (Report by Thomas T. Tunstall, U. S. consul, San Salvador, July 4, 1889.)

NICARAGUA.

Nicaragua is distinguished from the other Central American countries by its lower level and the great lake, which offers so inviting a route for an interoceanic canal. Geologically, Nicaragua is no less rich than Honduras.

The only port on the Caribbean Sea is San Juan del Norte, and this is not a very good one; the Pacific coast is bold and rocky, but has the convenient harbors San Juan del Sur, Brito, and Realejo.

Among the cities are Managua, 1,800; Granada, 16,000; Leon, 25,000; Rivas, 10,000; Chinandega, 11,000; Libertad, 5,000; Matagalpa, 9,000; Ocotar, 3,000; Greytown, 1,512; Blewfields, 1,000.

At Rivas the annual rain-fall is about 102 inches; elsewhere the summer rain-fall is about 90 inches, and in the winter less than 10 inches. The mean annual temperature is about 80° Fah., falling to 70° at night and rising to 90° in the hottest weather. This does not refer to the highlands.

RAILWAYS.

The only railway in operation consists of two sections, the first from *Corinto to Momotombo* (Lake Managua), 58 miles, begun in 1879 and completed December, 1883; the second from *Managua to Granada* (Lake Nicaragua), 32 miles, opened March 1, 1886, and of 3 feet 6 inches gauge. Connection is made between these two sections by steam-boats on Lake Managua, owned by private parties, and which are soon to be replaced by boats owned by the Government.

The road is owned by the Government and operated under the general direction of the minister of public works. In 1888 the cost of maintenance was 55 per cent of the gross earnings.

A railway has been projected by the Government from San Juan del Sur via Rivas to San Jorge, on Lake Nicaragua, but no work has yet been done.

A branch from Chinandega to El Viejo, about 19 miles, has been surveyed and located. Another Government survey is in progress for a line to connect the City of Matagalpa with some point on the east side of Lake Managua.

A concession for a railway connecting the City of Matagalpa with the east-coast at the mouth of the Ramos River has been granted by the Government to Don Pedro Ramirez, of Managua, who has sold it to English capitalists. The road is to be 90 miles long, and will tap the rich mining region of Acoyapa and La Libertad.

COSTA RICA.

The Atlantic coast is low and covered by dense forests, while the Pacific slope is characterized by wide savanas or llanuras. Between these borders are high volcanoes and an elevated table-land 3,000 to 4,000 feet above the sea, the latter almost the only cultivated land in the State. The forests are largely composed of valuable trees—mahogany, ebony, brazil-wood, and oak.

The range of mountains called the Cordillera of the Andes passes through the country from southeast to northwest, and is divided into several systems, separated by the valleys of the Reventazon and the Rio Grande. The first system forms two groups, one from the northwest boundary southeast to Mount Aguacate; the other consists of Mounts Poas, Barba, and Irazu. A large plain covers the northeastern part of the Republic, through which the San Carlos and Sarapiqui wind their way to the San Juan, and the Rio Frio and many smaller streams to Lake Nicaragua. Mr. Paul Biolley says: "This region is even to-day almost unexplored."

The San Carlos River is navigable 20 leagues inland from its mouth at the San Juan. The latter river forms a portion of the northern boundary of the State.

During the rainy season the rivers become torrents, especially on the Atlantic side. Several rivers of the northern slope present this peculiarity, that while their left banks are formed of dry lands free from marshes, their right banks present a succession of lagoons and localities frequently inundated, rendering them often unhealthful.

The hot lands extend to 3,000 feet above the sea, the Pacific side being the hotter. Above this height the climate is temperate. On the coast the mean temperature is from 20° to 26° centigrade, and on the highlands from 14° to 20°, corresponding to 57°, 68° and 79° Fahr.

Besides gold, the principal metals whose existence has been established beyond doubt in Costa Rica, but which have not been exploited, are, iron in abundance, copper, argentiferous lead, and quicksilver. Among other mineral products are sulphur, kaolin, lignite, limestone, marble, gypsum, alum, and mineral waters.

The exports of this country are coffee, dye and cabinet woods, bananas, and other fruits, hides, mother-of-pearl, sarsaparilla, cocoa-nuts, India rubber, etc. The principal imports are cotton goods, hardware, and provisions.

The principal ports are Limon on the Atlantic, and Punta Arenas on the Pacific, the direct distance between them being 102 or 103 geographical miles.

The population of the provinces of Costa Rica are, San Jose, 64,000; Alajuela, 51,000; Cartago, 34,000; Heredia, 29,000; Guanacaste, 16,000; Punta Arenas, 8,500; Limon, 2,000; containing the important cities of San José, 15,000; Cartago, 10,000; Heredia, 9,000; Alajuela, 6,000; Punta Arenas, 1,800.

HIGHWAYS.

From Cartago to Punta Arenas there is a fine highway, which is very uneven at the summit of Mount Aguacate, where it has an altitude of about 4,132 feet above sea level. It passes through Alajuela, Atenas, San Mateo, and Esparta, the total length being about 50 miles, owing to the circuitous route necessary to climb the elevations. Another important highway runs from San José, in the direction of La Palma; it crosses that height at 5,000 feet and then decends to Carillo 1,400 feet. In the 17¼ miles separating these two places, the road overcomes 3,600 feet of elevation. The road to Nicaragua begins at La Barranca, near Esparta, and crosses the province of Guanacaste 90 or 100 miles; it is bad in the rainy season because the even surface retains the water. Starting from Candelaria, south of San José and partly following the Pacific coast, there is a bridle path through Terraba and Boruca, ending on the Colombian frontier. A path starts from Angostura east of Cartago and leads to Talamanca.

The general traffic at the ports of the republic, imports and exports, can be taken

at 66,500 tons, and the traffic of the interior at 40,700 tons. About 50,000 tons of the general traffic are carried by the Atlantic Railroad, and judging from the past this will probably increase 40 per cent in the next five years. The freight per ton by the railway is $17 American gold.

RAILWAYS.

The Government projected about 1870, an interoceanic line from Punta Limon to Punta Arenas, a distance of about 172 miles. Construction was begun in 1871, but three sections only were completed, as follows: From Punta Limon to Carrillo, 70 miles; Punta Arenas east to Esparta, 14 miles; and from Cartago west via San José to Alajuela, 26½ miles; the latter division was opened January 19, 1872, the others as completed. Total built, 110½ miles. The line up the Reventazon Valley to Cartago, 48 miles, is now being built by English capitalists represented by M. C. Keith, and is to be completed by January, 1890. The earnings on the completed road are over 10 per cent. on the invested capital. From Limon to Cartago is 95 miles. The distance from Carrillo to San José is about 28 miles, over a steep mountain cart road. Esparta is connected with Alajuela by a mountain cart road, a distance of 35 miles.

The Government has appropriated $25,000 for a final survey of the part between Alajuela and Esparta, and proposals have been received for its construction. It is also intended to build a branch to the Port of Tivives. Lately a concession has been granted to an English company to build from San José to Esparta, about 36 miles, and another from a point near Esparta northwestward through Guanacaste to the Nicaragua boundary.

Another railway has been the subject of study of late, to unite Lake Nicaragua at the outlet of the San Juan River, with Punta Limon, which is in the hands of the Costa Rica Railway Company (limited) represented by M. C. Keith. This new road will start from Jimenez (10° 10′ latitude and 83° 45′ longitude), on the Atlantic Railroad, taking a north northwest direction through a very rich country for timber and agriculture, crossing the Sarapiqui at El Muelle, thence northwest to the Frio River at its entrance into Nicaraguan territory, a distance of about 90 miles from Jimenez. This line, with part of the Atlantic Division, might form a portion of an intercontinental railway, Matina being probably the starting point southward.

An English syndicate has secured a concession to build a road paralleling the Nicaragua Canal.

The cost of constructing railways, judging from past experience, will be, complete, from $60,000 to $70,000 a mile in the worst situations.

RAILROADS IN COSTA RICA.

The railroads already completed in Costa Rica are—

(1) From *Port Limon to Carrillo*, 70 miles—Carrillo being connected with San José by a steep mountain cart-road, a distance of 28 miles.

(2) The road from *Cartago to Alajuela*, passing through San José and Heredia; total length, 25 miles.

(3) From *Punta Arenas to Esparta*, 12 miles, Esparta being connected with Alajuela by a mountain cart road, a distance of 35 miles.

To complete the connection with Port Limon there is now being constructed 50 miles of new road from Cartago to a point near Siquires, on the Reventazon River. This new road is about one-third done. According to the terms of the contract with Mr. Minor C. Keith (contractor), it should be completed August, 1889, but Mr. Keith has had many difficulties to contend with, and it is not probable that it will be completed before August, 1890. The road from Port Limon to Carrillo (No. 1), from Cartago to Alajuela (No. 2), and the new line from Cartago to Siquires, together with the wharf at Limon, have been transferred to and are owned by the Costa Rica Railway Company (limited), of London. The Government of Costa Rica also granted to said company 800,000 acres of unimproved lands. The Government now owns, however, one third of the stock of said company. The Government also owns and

operates the railroad from Punta Arena to Esparta (No. 3). To preserve the trade of California with Punta Arenas it is necessary that the road from Esparta be extended to the interior. Otherwise, when through connection is made with Port Limon, upon the completion of the missing link from Cartago, all trade will go by way of Port Limon. This is important to San Francisco, and her business men could well afford to obtain from the Government of Costa Rica the transfer of the line from Punta Arenas to Esparta, and extend the same to the interior. If, however, the Nicaragua Canal is to be opened, and it is found advisable to follow the line mapped out by Mr. Menocal in 1855, I consider it of utmost importance to the trade interests of the United States to secure a railroad charter from this Government to run said road from the valley of the San Carlos River to San José.

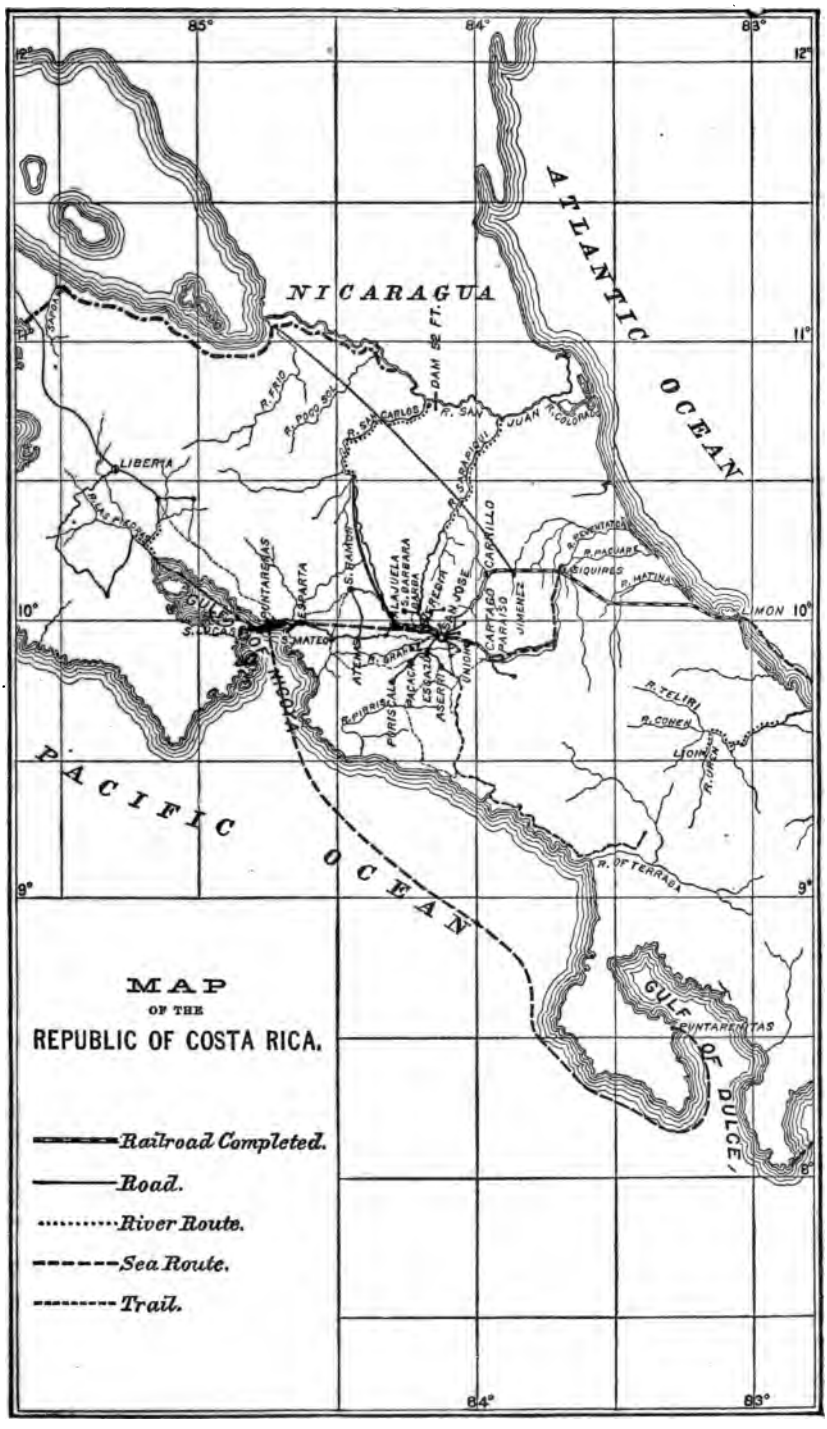
It is observed that Mr. Menocal (see page 26 of his report) proposes to build a dam 52 feet high at Ochoa, just below the point where the San Carlos empties into the San Juan River. The San Carlos is now navigable, I understand, by small boats to the "muelle" (wharf), some 30 miles. From this muelle to San José is some 60 or 70 miles. When the dam of 52 feet is built at Ochoa the San Carlos will be navigable much higher up. The San Carlos country is considered the finest section of Costa Rica. The lands are said to be of inexhaustible fertility and well adapted to the growth of bananas, cacao (chocolate bean), and cattle. At present there is no outlet to this section and it is undeveloped. A grant of lands along the railroad could be most probably obtained and would prove valuable, but, what I consider of far more importance, would give the trade of this country to the United States. The proposed road connecting with the canal would connect with steamers going both to ports on the Atlantic and on the Pacific. The aggregate exports and imports of Costa Rica last year (1887) were $11,000,000, of which the larger portion goes to and comes from Europe, and necessarily so when the ways of communication are owned in Europe. To illustrate: The freight on coffee per ton from Punta Arenas to New York is $26.40; to England, £3. From Limon to New York, $10; from Limon to England, £1 10*s*. It is also greater from Punta Arenas to San Francisco than to England, though I have not the exact figures. I think it very important to obtain this railroad charter to the San Carlos as soon as possible; otherwise it will be taken by an English company. Costa Rica is very anxious to have the canal on the route of Mr. Menocal's survey of 1885 rather than on the new line now being surveyed, and in making arrangements with her for the former route this railroad charter and grant could be secured on favorable terms. It may be that an effort will be made by English capital to secure this or some other railroad charter at the next Congress, which convenes in May. I have had some slight intimation that there is now a project on foot for a survey for a new railroad by an English company, but whether it is in connection with the grant of the 800,000 acres of land above referred to or another scheme I have not been able to learn.

I inclose a small map, upon which I have marked the road now being constructed from Cartago to Siquires, the proposed road from Esparta to San José, and from the muelle, on the San Carlos, to San José. (Report by J. Richard Wingfield, U. S. consul, San José, Costa Rica, March 30, 1888.)

RAILWAY SYSTEM OF CENTRAL AMERICA.

The late president, General Barrios, of Guatemala (as is President Menendez, of Salvador), was an earnest friend of the United States. Barrios, as does President Menendez, favored the assimilation of the institutions and business methods of his country to those of the United States. Barrios's ambition and the jealousy of his neighbors led to war with the little Republic of Salvador, which cost Guatemala a humiliating defeat and Barrios his life. Through his policy Americans were induced to invest in Guatemalan railways, banks, and coffee and sugar plantations. He projected and began the construction of a railway from the bay of San Tomas, on the Caribbean Sea, to his capital, Guatemala City, a distance of 150 miles, there to connect with the existing narrow gauge of the Guatemala Central, 75 miles in length, terminating on the Pacific at the open roadstead of San José. Forty miles of Barrios's transcontinental road, from Puerto Barrios to Guatemala City, were half finished when his untimely death occurred.

Barrios's worthy successor, the vigorous President Barrillos, pursues the policy of his predecessor, favoring the construction of the transisthmian and other railways projected in Guatemala, and notably of that designed to connect the capitals of Guatemala and Mexico. In truth, General Barrillos and other Central American statesmen have not failed to discover that no Central American Union is desirable which may be pinned together with bayonets, and none desirable and enduring can be achieved save through the intervention of perfect interstate railway systems.


85°
84°
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11°
10°
9°
NICARAGUA
ATLANTIC OCEAN
PACIFIC OCEAN
LIBERIA
SAN JOSE
CARTAGO
PARAISO
JIMENEZ
LIMON
GULF OF DULCE
GULF OF NICOYA
R. OF TERRABA
MAP
OF THE
REPUBLIC OF COSTA RICA.
Railroad Completed.
Road.
River Route.
Sea Route.
Trail.

THE MESA OF SALVADOR.

Discovering, during a three days' sojourn at La Libertad, at the sea level in Salvador, how fatal to unacclimated persons was the breath of the sea at the very shore, drenched as it is each day by tides which leave heaps of shell and other fishes to rot instantly beneath the rays of the equatorial sun, and learning that Panama was thus made a grave-yard, because ships can not touch the shore and passengers must inhale yellow death through weary deadly days and nights while tugs and lighters discharge tedious tasks—seeing and learning this at La Libertad nearly two years ago, I sought a perfect harbor on the Pacific coast whence to extend a railway to another on the Atlantic. It is the foul breath of the sea-shore at the sea level at points unswept by winds from boundless seas that makes the word "Panama" the synonym of pestilence and death. To avoid detention at the sea-shore in hot latitudes ships must anchor at wharves within land-locked harbors whence passengers may be transferred instantly by railways to the mesa or elevated plateau from 2,000 to 3,000 feet above the sea level, and extending from one to the other ocean.

A CONFESSED FACT.

The Nicaragua Canal and the Ship Railway and De Lesseps Canal each and all are at the sea level. No soft, cooling wind from the Pacific may find its way into either canal or follow gigantic locomotives tugging at ships crossing Tehuantepec, and the acclimated alone may cross the continent in safety at the sea level; but there is perfect immunity from climatic diseases the instant the traveler reaches an elevation of 1,000 feet above the sea. Commerce, therefore, will traverse the ship railway and the canal; men and women will prefer this transisthmain railway, having a perfectly land-locked harbor at each terminus and an elevation at no point after leaving the coast of less than 2,000 feet above the plane of the two oceans.

WONDERS OF THE INTERIOR.

Eighty miles from the harbor of La Union, going north through the greatest length of Salvador, the traveler will rest at the fathomless lake of Ilopango, 25 miles long and 8 to 10 miles wide. Its tepid waters occupy craters of extinct volcanoes. In 1870, when Salvador was shaken violently by earthquakes, the water of the lake sank in the night 9 feet, and along its shores were gathered earthen vessels curiously colored, and images carved out of porphery, and others precisely like those at the museum at Washington taken from Egyptian tombs. A few miles southeast from the railway the ever-active volcano Izalco rises 6,000 feet, a perfect cone, from the plain about Armenia. The railway crosses the State of Santa Ana, a district of Salvador 50 miles square, producing, it is stated, more coffee than any equal area of land in the world. In truth, every acre of the *mesa* of Salvador is cultivated, each producing from two to four crops annually. The products are rice, tobacco, indigo, sea-island cotton, coffee, sugar, cocoa (chocolate), india rubber, and Peruvian gum—so called because it was originally sent from Salvador to Peru and thence to European markets. The railway penetrates from La Union to Puerto Barrios, or to Port Izabal, whichever harbor may be its northern terminus, a very paradise. The average density of population along the whole route exceeds 100 for each square mile. Here villages and towns are almost conterminous, and the population—Aztecs 92 per cent. and Spanish 8 per cent—toil most industriously. Labor costs 20 to 25 cents, and food 10 cents per diem. The thatch-roofed, floorless adobe huts of the natives (Aztecs) are the cheapest possible, and only useful in protecting the occupants against rain-storms of July, August, and September (the rainy season), when the country is flooded almost every day. There is not a stove or fire-place in any house in the Republic; none are needed where the thermometer never falls below 70 or rises above 80 degrees. So great is the annual production of fruits, as well as of indigo, tobacco, sugar, and coffee, and so short the distance from Port Barrios to Mobile, that it is believed that most delicate and delicious tropical fruits, never seen in the United States, will be distributed everywhere from Mobile; and so redundant are the crops of Salvador and of the districts of Guatemala penetrated by this railway, that it must have two tracks—one for immense local, the other for interoceanic, freights and travel.

POLITICAL RESULTS.

But the great good to be achieved by this transisthmian road consists not so much in the fact that it will enable traveling multitudes to cross the continent where narrowest, without possible danger from deadly fevers and plagues incident to detention at the sea-level, but with its branches, binding together these five Central American

States in perfect political and social unity, it accomplishes their perfect *commercial* annexation to the United States. Puerto Barrios is within fifty hours or less of Danphin's Island wharves at Mobile, and only sixty hours would be required to transfer a traveler or bale of goods from Mobile to the Pacific coast harbor of La Union. United States and other steamers now pay from $20 to $30 a ton at La Union for English or Australian coal. It may be delivered there from Alabama, over the transisthmian railway, for from $5 to $7 a ton. Therefore, the Government of the United States as well as the people must confess keen interest in this short, easily-built railway, which surely must accomplish most beneficent political and commercial results.

AMERICANS PREFERRED.

After the plan of the transisthmian railway was conceived and the details published, and after applications were made for charters in Salvador and Guatemala, English and French bankers and capitalists sought much the same concessions; but the governments of Salvador and Guatemala both gave preference to the American applicant for these franchises. The Salvador charter conceded a monopoly for fifty years of the right of excess to the matchless harbor of La Union. The cost of a double-track road from La Union to Port Izabal, or Port Barrios, it is stated by engineers who have surveyed part and traversed the whole route of about 300 miles, will not exceed $35,000 a mile; there will not be a tunnel on the whole line, or a grade greater than 70 feet on any mile, and this only at each terminus, whence locomotives must climb, within 30 or 40 miles, to the mesa 2,000 feet above the sea.

The rapid multiplication of foundries, furnaces, and forges in Alabama and other Southern States induced the writer to seek, for the behoof of the commonwealth which is his home, an insatiable market for its products, to be found alone along the western shores of the three Americas. From every trading place of as many as two or three thousand inhabitants along this interminable coast a railway will soon lead to farms and villages of the interior. Twelve such railways are now building between the southern confines of Chili and California. If the transisthmian railway be speedily finished, the iron and coal and steel of England and Australia may be supplanted everywhere on the Pacific by that produced in the United States. (Report by L. J. Du Pre, U. S. Consul, San Salvador, December 13, 1887.)

BRITISH HONDURAS.

A road has been projected from Belize westward 90 miles to the frontier; from there it will probably go to Lake Peten.

SOUTH AMERICA.

It will be observed that the continent of South America has a general triangular shape. In the north a mountain system runs east and west; again we find the same thing farther south in Brazil. In the west is the great chain of the Andes traversing the entire continent from north to south. Leaving Patagonia, they enter Chili, rising higher and higher, until they culminate in the volcano Aconcagua. At the boundary of Bolivia, the chain turns to the northwest and separates into two, inclosing the table-land of the Desaguadero, a wonderful valley, having at one end Potosi, the highest city in the world, and at the other Cuzco; between them is Lake Titicaca, from which not a drop of water escapes except by evaporation. At Pasco a third cordillera is thrown off, and with a triple arrangement and a lower altitude the Andes enter the Republic of Ecuador, where the double line is resumed. Just above the equator one ridge is formed which then spreads out like a fan; one cordillera goes to the east, giving rise on its eastern slopes to the Orinoco and its tributaries, the central cordillera having the volcano of Tolima, soon loses itself in the Carribbean Sea, and the western turning to the left, with a much lower altitude traverses the isthmus, rises in altitude, and expands again to form the table-land of Mexico. The snow limit at the equator is 15,800 feet; at 27 degrees it is 13,800 feet, and at 33 degrees it is 12,780 feet. Twenty-two of the fifty-one volcanoes in the Andes have their summits covered with perpetual snow, and twenty encircle the valley of Quito.

The Andes almost stop the trade-winds (which are again felt at 150 miles from the coast), causing them to drop their moisture on the eastern slopes, and thus give rise to those great rivers, the Orinoco, the Amazon, and the La Plata, which, flowing eastward, almost quarter the continent.

Near Cerro de Pasco in a little lake, just below the limit of perpetual snow, and scarcely 60 miles from the Pacific rises the greatest river in the world. Flowing northerly 500 miles through a deep valley, it turns on reaching the frontier of Ecuador to the right and runs easterly 2,500 miles. At Tabatinga, 2,000 miles from its mouth, it is a mile and a half wide. So many and far-reaching are its tributaries that it touches every country of the continent except Chili and Patagonia. These tributaries communicate with each other by so many intersecting canals that Central Amazonia is a cluster of islands, and if a circle be drawn 1,600 miles in diameter it will include an ever green unbroken forest.

The Amazon really lies in a plain, for the slope from the mouth of the Napo to the ocean, in a direct line 1,800 miles, is but 1 foot in 5 miles. A fair conception of this will be obtained from an examination of the altitudes on the edges of this plain, bounded by the grassy plains of Veneznela, the chain of the Andes, and the table lands of Matto Grosso.

The Cassiquiare, a natural canal three-fourths of a mile wide, and with a portage of only two hours, connects the headwaters of the Orinoco and the Amazon.

Of the tributaries of the Amazon, the Putumayo and the Napo rise among the mountains of Colombia and Peru. The Pastassa rises in the valley of Quito and traverses a very steep course; the Maranon, or the main river, rises near Cerro de Pasco. The Huallaga comes from the Peruvian Andes at an elevation of 8,600 feet, and is navigable for steamers to the port of Moyobamba. Its mouth is a mile wide. Canoe

navigation begins at Tinga Maria, 300 miles from Lima. The fertile plain through which it flows is very attractive to an agriculturist.

The Ucayali originates near Cuzco. For 250 miles above its mouth it averages half a mile in width and has a current of 3 miles an hour; at Sarayacu it is 20 feet deep and it is navigable at least 100 miles. East of the Ucayali are six rivers rising in the unknown lands of northern Bolivia, of which the most important is the Purus, a deep, slow river over 1,000 miles long, open for navigation half way to its source.

The Madeira is about 2,000 miles in length. One branch, the Beni, rises near Lake Titicaca; another, the Marmoré, near Chiquisaca, within 15 miles of the sources of the Paraguay, and if it were not for the rapids 480 miles from its mouth large vessels might sail from the Amazon into the heart of Bolivia. Another great tributary of the Amazon, the Tapajos, about 1,000 miles long, rises only 20 miles from the headwaters of the Rio Plata.

A number of routes are open across the continent: At the harbor of Buenaventura in Colombia, a railroad is to be built to Cali in the Cauca Valley. The valleys of the Magdalena and the Cauca have been followed to their sources, but I do not know of any passage in that vicinity to the headwaters of the Amazon. From San Lorenzo, Bahia, and Guayaquil, in Ecuador, there are routes to Quito, whence the eastern ridge may be crossed to Papallacta, Archidona, and the Napo. The route from the Quito Valley, via the Pastassa River in Ecuador, is difficult on account of the rapids, and dangerous because the inhabitants are hostile. The route via Loja in Ecuador and the Maranon is also difficult. The best route of any is from Trujillo in Peru to Caxamarca, Chachapoyas, and Moyabamba, thence from Balsa Puerto by canoe to Yurimaguas and down the Huallaga.

From Lima in Peru there is a road to Tinga Maria, via Huanaco and then down the Huallaga, which is difficult in the rainy season; or from Lima to Mayro, via Cerro de Pasco and Huanaco, and down the Pachitea and the Ucayali.

There is a route through Bolivia to Cochabamba and down the Marmoré and Madeira, or to Santa Cruz and the Paraguay River. The route through the Uspallata Pass in Chili is now followed by a railroad to join the railways of Argentine.

But little is known of the Amazon basin beyond the limits of the river banks; it is thinly inhabited and only by uncivilized people. All the travelers through this region speak of the density and profusion of the foliage. The Pampas of Sacramento are thickly covered with trees, and the vegetation in all parts almost entirely prevents communication.

In Raimondi's Peru there is mention of a journey by Señor Reyes from Popayan, in Colombia, across the Cordilleras and down the Putumayo, but no description is given of the route.

In the proceedings of the Royal Geographical Society for 1880 there is a statement of the parts of South America not yet thoroughly explored. They include the headwaters of the Amazon in Ecuador and Colombia, and the parts of Colombia between the western Cordilleras and the Orinoco and Negro, and between the river Meta and the rivers Uaupes and Japura.

The inhabitants of South America live upon its outer borders; in the southern part the mass of population is on the sea-coast, farther north on the interior plateaus.

On the Andes the rainy season sets in toward the end of September and lasts until March, when the dry season begins. During the rainy season the roads become so bad that travel is almost suspended.

Gold and coal are found at Chiriqui, Colombia, and in abundance in other parts of the State. Coal is found near Huanca, in Peru, at a height of 14,700 feet. Among the exports of South America are gold, silver, copper, tin, and other ores, guano, niter, sugar, wool, cotton, tobacco, vanilla, cinchona, cocoa, Peruvian bark, India rubber, coffee, hides, wheat, etc. The soil of the mountain valleys is rich and fertile.

Traffic is carried on by mule or railway directly to the coast; or by mule, almost in the opposite direction to the headwaters of the great rivers, whence it goes to the

coast by canoe and steam-boat. Many of the rivers have regular lines of boats. The Magdalena is navigable to Honda for steam-boats and above that for a long distance by canoe. The Putumayo is navigable to the boundaries of Colombia; the Maranon, Huallaga, Ucayali, Purus, and Marmoré carry the products of Peru and Bolivia; the La Plata and San Francisco those of Bolivia, the Argentine Republic, Urugnay, Paraguay, and Brazil; and the Orinoco, of Brazil, Venezuela, and Guiana.

COLOMBIA.

GEOGRAPHICAL FEATURES.

The republic of Colombia may be called one of the most important countries of South America, situated as it is near Central America and connected with it by the Isthmus of Panama. In the south the Andes Mountains, dividing into three chains, traverse the country from north to south. The western Cordillera follows the coast, with a decreasing altitude, turns to the northwest, and traverses the isthmus to Central America. On the Atrato River line its highest point is about 900 feet; on the Panama canal line it is only about 300 feet. Beyond this point the elevation increases. The central Cordillera passes northward until it is lost in the Caribbean Sea. In this chain lie several volcanoes of great height; in the northern part it is somewhat broken and of lower level. The eastern Cordillera turns slightly to the east in its northern part and forms the boundary between Colombia and Venezuela. In the southern part of the republic there is a portion of the chain previously mentioned as crossing the continent from east to west.

The topographical features of the isthmus lend themselves in numerous places to interoceanic communication. Routes for interoceanic canals have been surveyed at the Chiriqui Lagoon, at Colon, where work has been in progress for a canal, at the Gulf of San Blas, Caledonia Bay, and the Atrato River. The ranges of mountains determine the water systems. On the western coast small streams flow into the Pacific; in the interior, the Cauca, with its many tributaries, rises at an elevation of 14,000 feet, and flowing north passes through the lower portions of the central Cordillera to unite with the Magdalena not far from the coast. The Magdalena, navigable for 600 miles, and having the volume of the Mississippi, is the great artery for the commerce of Colombia. It flows northward into the Caribbean Sea between the central and eastern Cordilleras, and it is said that both the Cauca and the Magdalena have their origin in the Lakes Las Papas.

At Honda the rapids in the river form the head of steam-boat navigation. Navigation is carried on for 175 miles above them by steam-boat and for several hundred miles further by canoe. The Cauca Valley is throughout much higher than that of the Magdalena. The Cauca River is navigable for a short distance only, to the rapids, but above them a steam-boat line carries navigation several hundred miles.

On the slopes of the eastern Cordillera are numerous sources of the Orinoco and the Amazon, separated by the central range. The whole of Colombia may be called mountainous, except along the northern coast, where the land is level and the water-courses numerous. Communication is consequently difficult in all parts. The old maps show the great Spanish highway from Quibdo on the Atrato southward to Popayan, Pasto, and Ecuador. This highway is said to have been used to carry the products of the mines of Peru, Ecuador, and Colombia to the port of Cartagena, whence they were taken to Spain. The water-courses and the great mountain valleys constitute the highways. In the north and northwest the ranges are easily crossed at numerous points (the canal routes have already been mentioned), but in the south the passages are few. The one best known is the Quindio Pass.

In the far south little is known of the country. In Raimondi's Peru, as previously mentioned, the author speaks of El Senor Reyes having gone from Popayan to Pasto, thence across the Cordillera and down the Putumayo, where there has since been es-

tablished a line of steam-boats by which commerce of the Department of Cauca is carried into the Amazon. I have been able to find only general descriptions of Colombia, and of these the leading features have been given. The products of this country find their way to market upon the backs of mules, or by means of boats upon the numerous water-courses. Roads, properly so-called, are not general; they exist merely as mule tracks. Efforts have recently been made to effect an improvement in this respect, and military labor has been used for the purpose. A road suitable for vehicles was opened about a year ago from Bogotá to the Magdalena River. A good road has also been opened from Quibdo to Medellin, touching the rich mining towns along its route.

RAILWAYS.

With the exception of the Panama Railway, 47 miles in length, there are only about 180 miles of line constructed, although many more have been projected, with promises of liberal aid from the Government. A report of Vice-Consul Whelpley, with a map, is added, from which a good idea may be obtained of the roads mentioned. There are several others of importance: the Cucutá railway, in the eastern part of the State, connects San José de Cucutá with the Zulia River at Villamazar, and the Savanna railway joins Bogota and Facatativa on the plain of Bogota. The Panama railway, uniting the two oceans at Colon (Aspinwall) was chartered by the State of New York in 1849 and was opened in 1855. Its immediate purpose was to provide a route to California, but has since become a great commercial highway between western Europe and eastern Asia. It may soon be rivaled, however, by the railways to be constructed in Guatemala and Costa Rica and by the Nicaragnan Canal. It is said that a French-Belgian syndicate is endeavoring to secure a concession from the Government to build a railway from Cartagena to Bogotá, and from Bogotá to Buenaventura, and that the syndicate is ready to complete the road provided the Government will guarantee an annual interest of 5 per cent. upon the capital.

A concession has been granted to a French syndicate for a line from Bogotá to the Orinoco River, and very recently the Department of Bolivar has contracted for the construction of a line from Cartagena to Cucutá, a distance of about 350 miles, with the subvention of a large tract of land for each mile of line constructed. Dr. Nuñez, President of the Republic, highly approves a line up the Atrato River to Quibdo, with a branch to Medellin, and thence up the Cauca Valley to Popayan. Connection might be made to Bogota over the Quindio Pass. It would pass through the Choco district, the richest in the world, and would reach a population of 800,000 people. Along its route would be found coal, gold and silver, india rubber, and great quantities of coffee.

The following table shows briefly the railways of Colombia, the first figures showing length of line when finished, the second the portion in actual operation:

Name of railway.	Terminal points.	When finished.	In operation.
		Miles.	*Miles.*
Panama Railway	Colon to Panama	47	47
Bolivar	Baranquilla to Puerto Belillo	20	20
Cucutá	Cucutá to Villamizar	34	34
La Dorado	Conejo to Honda	30	18
Girardot	Girardot to Bogotá	96	20
Antioquia	Puerto Berrio to Medellin	125	30
Cauca	Buenaventura to Cali	85	12
Santa Marta	Santa Marta to Cienaga	20	20
Santander	Puerto Wilches	75	1
Savanna	Facatativa to Bogotá	24	24
Total			226

To these are to be added the projected roads from Cartagena and Bogotá.

Another great scheme has recently been advanced of connecting the Port of Cartagena with the railways of Peru by a line up the Magdalena Valley, traversing the valley of the Amazon, and again crossing the Andes in Peru. A charter has been granted by the legislature of Virginia for the formation of a company to build this road.

An important transportation route has been traced by Dr. Nuñez, President of the Republic, as follows: A railroad to be built from Bogotá to the river Meta, 120 miles; thence by water down the Meta and the Orinoco to the Cassiquiari; along this latter river a railroad to be constructed 240 miles to the river Negro, and thence to the Amazon and its tributaries by water.

COLOMBIA—GEOGRAPHICAL FEATURES.

The official name of the country is the "Republic of Colombia." It is bounded on the north by the Caribbean Sea, on the east by Venezuela and Brazil, on the south by Ecuador, and on the west by the Pacific Ocean, and includes the Isthmus of Panama as far north as Costa Rica. Its southern boundary is near the equator. It is traversed by ranges of the Andes, and is one of the most mountainous countries of the world. The soil of the valleys and plains is rich and productive, and many of the mountains are covered with green even to their summits. The climate varies with the altitude, from the tropical heat of the coast and great river-beds to the cold of perpetual frost.

Bogotá, the capital, contains 75,000 people, and is situated upon an immense productive plain at a height of 8,500 feet above sea-level. The temperature averages 60° above zero, and the climate is salubrious.

CHARACTERISTICS OF THE PEOPLE.

The population of Colombia approaches 4,000,000, and consists of Indians, negroes, half-breeds, and the whites, who are the descendants of the Spanish conquerors. The common people are industrious, simple, hospitable, and of singular probity. Life and property are absolutely safe. Highway robbery would be a novelty, and courtesy to strangers is proverbial. The upper classes are well educated, intelligent, desirous of progress, courteous to strangers, patriotic, and sensible. The Government is a centralized republic. Absolute peace has been maintained since 1885. The property and rights of foreigners are respected and protected. The disposition of the government and of all classes is friendly to foreigners, and with rare exceptions the people are especially inclined to the citizens and institutions of the United States. They like our products, and prefer many of them to those of European countries. (Report by Minister Abbot, of Bogota, September 4, 1889.)

MINES.

Colombia is without doubt rich in mineral resources. The mountainous part of the interior abounds in gold and silver, and in some parts iron is found in considerable quantities, while on the coast, in the region of Santa Marta, copper exists. The working of the iron mines has not proved a success, while the copper has not been attempted. An American mining engineer has lately reported petroleum in very considerable quantities to exist in Tubara, 12 miles from Barranquilla, and within the limits of this consular district. But the principal mines are of gold and silver. Until a few years ago these mines were almost entirely in the hands of the English; but recently there has been an influx of American enterprise, capital, and machinery. It is too early yet to say what will be the outcome of this, but with better communication and facilities for getting the heavy machinery into place there seems to be no reason why these mines will not be worked to advantage.

COLOMBIAN RAILROADS.

The information, obtainable only from Government archives at the capital of the nation—so distant and so unapproachable except with a "golden key"—has rendered it necessary to rely on my own observations and the engineers in charge of construction and management. I inclose a plan of the railroad system, presuming it may lead to a better understanding of the present report. The railroad system of the interior of Colombia is as yet in its embryonic stage and slow in growth.

The capital that might have built railroads and brought remunerative order out of a chaotic realm of natural wealth has been mainly spent in fostering and suppressing political revolutions.

The internal resources of Colombia in precious metals, coal, iron, copper, gums, dye woods, medicinal plants, fibers, and valuable timber should rank her among the most prosperous in the family of republics.

The only road in this consular district in actual service is the Bolivar, between Barranquilla and Salgar, the port for shipment. A branch road to Puerto Colombia, not yet completed, will terminate at the pier now building, where steamers can discharge and receive freight in the future. The railroads to be considered are the Bolivar, Cauca, Jirardot, the Antioquia, and the Dorado. I name the Bolivar first as being the first in importance in its service and aid to foreign commerce, as well as in its perfect management.

A slight digression here may obviate a more prolonged explanation later. The mouth or delta of the Magdalena River, the great commercial artery for eight States of the Republic, is obstructed more or less at all seasons by a shifting bar formed by the sediment of the Magdalena, the Cauca, and their hundreds of tributaries. It is and has been a "marine cemetery," so to speak, for the past forty or fifty years. Vessels enter the river sometimes with from 18 to 20 feet of water on the bar, but a few days later, when cleared for departure, there may be but 9 or 10. Loaded vessels outward bound have waited sixty or seventy days watching for the favorable combination, which seldom occurs, of a fair wind, good depth of water on the bar, a moderate sea, and a reliable pilot to get safely out of this aquatic trap. And it is not an exaggeration to say that one-quarter part of the sailing craft has been lost in exit or entrance. Vessels have been lost on the bar when in tow of a powerful tug-boat and piloted by one of the best experts on the coast. During the past month an American schooner, the *F. G. French*, of New Haven, could not get out on account of the heavy sea on the bar, the prevailing northerly wind, and the uncertainty of the eccentric channel, which may or may not be as it was upon the entrance. A British barkentine has been nearly two months in the same dilemma, and on the 26th ultimo the German brig *Enrique* was lost with a valuable cargo, and two of her officers were drowned, in endeavoring to reach the proper entrance to this delta of the Magdalena; a river 800 miles in navigable length, exclusive of its tributaries, one of the great rivers of the world, but without a light-house, a beacon, or even a buoy to mark its entrance, with no landmarks, no pilots, and a channel as shifting and unstable as the sands that bar the entrance. It was to obviate this peril to life and property that the Bolivar Railroad was constructed.

When the branch to Puerto Colombia is completed steam-ships can lie alongside a pier in smooth water, in a port easy of access, to discharge and receive freight. Sixteen thousand three hundred and seventy-one tons of exports from the interior have been passed over this road for shipment during the year 1887, and 11,848 tons of imports have been delivered at the Barranquilla terminus for the interior trade.

The exports are from the marginal towns and villages along the rivers accessible by river steamers, and only a fractional part of what might be sent to the coast for foreign markets reaches commercial channels through a lack of proper roads and the scarcity of labor. Seven steam-ship lines touch at Salgar to discharge and receive freight, mails, and passengers. German line from Hamburg twice a month; Royal Mail twice a month to and from Southampton; West India and Pacific, English, twice a month from Liverpool; Atlas, English, from New York, twice a month; Harrison, English, Liverpool and New Orleans, twice a month; General Transatlantic, French, twice a month, and the Spanish line twice a month. The passenger traffic over the Bolivar road from and to the Salgar terminus has more than doubled during the past three years.

Should the Dorado and the Antioquia roads be pushed to completion there would be four trains or more daily to Salgar instead of only two, as at present. But of these roads we will speak in the proper routine.

The Bolivar is under American management; is owned by private parties. The rolling stock now in service, of English manufacture, will be replaced as the necessity arises with American. The extension of the branch road to Puerto Colombia, on the northwest side of Salgar Bay, makes the distance from the Barranquilla terminus to the pier eighteen miles. The Salgar terminus will probably be abandoned in the immediate future.

Barranquilla to Salgar wharf is 14 miles, and the necessity for steam-tugs and lighters between Salgar and the shipping will soon be abolished, and probably lower rates of freight will be established to the pier at Puerto Colombia.

The rate for passengers at present is $5 per capita for first-class from Barranquilla to the shipping, or *vice versa*; $3 for second class; and freight at the rate of $2.50 per ton.

The Cauca Railroad.—This road, the construction of which was commenced in 1878 and was to connect with Cali and the west bank of the Cauca River, has its present

terminus at Cardova, 12 miles from Buenaventura. It is now government property; has been surveyed to Cali, but the work has been suspended.

At the time the contract was made the National Government ceded to the grantee 500,000 acres of wild land on both sides of the line in alternate lots of 10,000 hectares each. During the construction of the road, and for five years after its completion, all the material for construction and operation—tools, food, medicine, etc.. were to be free of duty, tax, or impost. The State governments of Cauca and Antioquia were joint share-holders, the National Government agreeing to contribute $3,000,000, one-half of the estimated cost of the road. An exclusive franchise for forty years was guarantied by the National Government. The passenger tariff for the 70 miles—Buenaventura to Cali—was to be $5 for first class, $3 for second class, and 1 cent a pound for freight. For way traffic a differential tariff would be established within the specified limits.

An integral and important part of the contract was the construction of a pier at the port of Buenaventura to accommodate loaded trains and ships drawing 20 feet of water. As far as can be learned from unofficial sources, failure in payment of promised subsidies and revolutionary troubles have prevented the continuance of the work. The grantee on the one part and the Government on the other made an amicable adjustment, and the line as far as completed (12 miles) became the property of the government of Cauca and the nation, and its future is a matter of vague uncertainty.

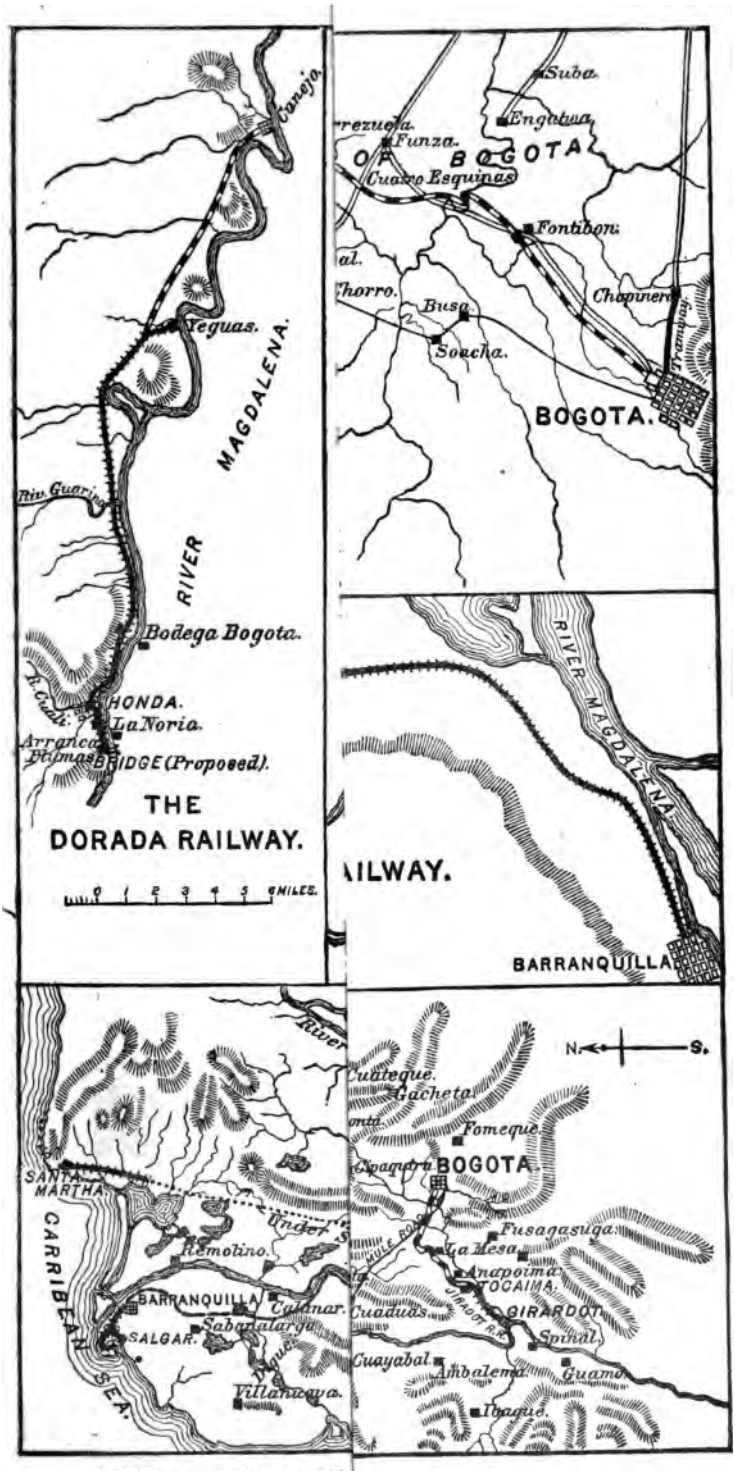
The Jirardot Railroad.—By reference to the accompanying plan it will be seen that this line has been completed to Portillo, 12 miles. The line has been surveyed to Bogotá, a distance of about 80 miles. It is a Government enterprise, and presents engineering difficulties of no ordinary character. The work is progressing slowly, but owing to the topographical features of the route, gradients will be necessary at several points on the line of survey; and it is considered doubtful whether the road when completed will ever pay its running expenses. Passengers coming up the river en route for Bogotá prefer to leave the river steamer at Yegnas, taking the Dorado Railroad to Honda; then they cross the river and proceed by the old mule road, consecrated by a century of usage. Comfortable hotels, in picturesque locations, break the journey into easy stages, and whether for business or pleasure the majority of travelers who have had a surfeit of river travel between Barranquilla and Yeguas do not care to spend two or three days more on a small steamer on the Upper Magdalena for the doubtful pleasure of skirting mountain spurs and crossing ravines on trestle-work among the Cordilleras. Remarks on the future progress and prospects of this line would be premature; its history is a subject for the future. (Gauge 3 feet, rail 30 pounds, section completed in 1884.)

The Antioquia Railroad.—From Puerto Berrio to Medellin, 125 miles, has been completed to Pavis, 30 miles from Puerto Berrio. The first contract for this road was signed in February, 1874, modified on the 4th of May following, and in July, 1876, a new contract was made for the termination of the line at Barbosa, a distance of 100 miles from Puerto Berrio. This also is a road of heavy gradients. The State of Antioquia was to contribute at the rate of $17,700 per mile, but not to exceed a total of $2,000,000, upon which basis State bonds were issued. The State of Antioquia, as share-holders of one-third part of the enterprise, owned the right to one-third of its proceeds. The grant was for the period of fifty-five years, with exclusive privilege for thirty years, beginning from the 1st of March, 1883. The same immunities and privileges in regard to duties and taxes as specified for the Cauca road were also conceded for the Antioquia. The maximum rates of fare and freight were: For first-class passengers, 12 cents per mile; second class, 8 cents; third class, 4 cents. Imports, 30 cents per ton per mile; exports, 25 cents, and coffee and tobacco 15 cents a mile.

With this brief summary of the principal features of the grant it may not be amiss to mention some of the difficulties.

There are to be 22 bridges, 115 trestles, 58 culverts, 4,135,288 cubic yards of earth-work, and 177,242 cubic yards of retaining walls. The central Cordillera to be passed at its greatest depression, 5,177 feet above sea-level, "requires the adoption of 6 per cent. gradient." But in spite of the difficulties to be overcome, the original design of the projector, the grand project of joining the Magdalena Valley to the Pacific coast by the union of the Cauca and the Antioquia roads would open up a realm of wealth. There are five hundred and eighty mines of gold or silver constantly worked, a large number without machinery, within those mountain barriers, only accessible by bridle-paths, rendering the transportation of proper tools and machinery impossible. On some of the interior rivers marble in inexhaustible quantities could be quarried, especially on the Claro and Nare.

Coal belts have been discovered, alum, sodium, calcium, manganese, cobalt, lead, zinc, mercury, arsenic, and platinum have been reported upon; agates, jaspers, and variegated marbles are found in the mountains. The population of the more mountainous regions of Colombia are the bone and sinew of the nation—hardy, persevering, and industrious—good herdsmen, agriculturists, or foresters in times of peace, and *brave and reliable soldiers in war.*



S. Ex. 125——face p. 126.

Sugar, cotton, corn, rice, wheat, tobacco, cocoa, coffee, aniseed, are some of the productions awaiting an outlet from the valleys and table-lands of the interior to navigable waters. The space to which this report should be limited prevents a more detailed description of domestic and forest products intended to be reached by the Antioquia Railroad.

The Dorada Railroad.—It is necessary to refer to the Magdalena River, especially to that portion of the river between Honda and Yeguas, unnavigable when the water is low on account of the rocks, shoals, and rapids in that section of the river.

In 1872 the State of Tolima granted an exclusive privilege for constructing a railroad between the waters of the Lower Magdalena, at Caracoli, and the Upper Magdalena, at Honda, and a bridge across the river at Honda. A series of rapids and falls at this place forms a barrier between the upper and lower rivers.

The National Government guaranteed, for twenty-five years, 7 per cent. interest on the sum of £42,000 sterling—the estimated cost of the work. The preliminary surveys elicited adverse reports. That the capital so guaranteed was insufficient for the purpose, and that such a short line would be expensive in working, especially in competition with the time-honored mule train, that would still absorb a good portion of the traffic on the 3 miles of road. Navigation being difficult and dangerous for at least 30 miles below Honda, application was made for and a new concession granted with exclusive privileges. English capital could not be found for the original plan, as the cost was estimated at £16,600 sterling per mile. Taken by itself this seemed excessive, but in conjunction with 27 miles on which the cost would be exceptionally low, the average cost did not seem so great. The projected plan for the extra concession was to connect a port below El Dorado with Honda, and the bridge to cross the river at that place—about 30 miles along that part of the river most obstructed by shoals and rapids. The road has been completed to Yeguas, about 18 miles. Owing to revolutionary disturbances, additional time was granted (to August, 1885) to extend the road to Conejo.

The National Governmen t grants a subsidy of $5,833 per mile, as completed, and an exclusive privilege for eighty years, at which period it is to become the property of the nation. Seven per cent. annual interest is allowed for any delay in the payment of the promised subsidy. The road between Caracoli, below Honda and La Noria, above Honda, has been in service since June 1, 1882, effectually uniting passenger and freight traffic between the waters of the Lower and the Upper Magdalena. This, the most difficult part of the road, cost $64,000, and the engineers have estimated the remainder of the road at a cost of $16,000 per mile.

The bridge across the river at Honda will probably be built in the future, but as yet nothing has been done towards its construction. Some five years ago a Colombian railroad enterprise was inaugurated to construct a railroad from Puerto Wilches, on the eastern bank of the Magdalena River, to follow the valley of the Sogomosa River and reach Bucuramauga. The line was surveyed and a short section of track, less than a mile, was laid.

Both the State and the National Government contributed aid to the project. Presumably the revolution of 1884-'85 caused its suspension. Rumors of a new contract are current, but no official data has come to hand in regard to its prospects. Before closing this report mention should be made of a projected railroad scheme to connect Santa Marta with one of the up-river ports. There are 20 miles of road completed from Santa Marta to the Cienega station, and the line is being surveyed, it is reported, to Banco. As a large section of the line south of the Cienegas is on alluvial lands subject to overflow, and the main portion is through swamp jungle and across various lagoons and water-courses of promising difficulties, it would be premature to express any positive opinion as to its future. There are said to be copper mines in course of development within reach of the line that may be largely remunerative in the future, but it is doubtful whether profits derived solely from such a course would be able to cover the interest on sufficient capital to build such a road—through a district very sparsely populated—and in competition with the steam-boat lines. (Report by S. M. Whelpley, United States vice-consul, Barranquilla, March 10, 1888.)

VENEZUELA.

The total area of the Republic, in its official statistics, is computed at 1,639,398 square kilometers (of which 2.59, or nearly 2½, make 1 square mile, English); of this, the section south of the Orinoco River and its great tributary, the Apure, and the delta of the former, contain the State of Bolivar and the territories of Yurnary, Caura, Alto Orinoco, and Alto Amazonas, with a collective area of 1,044,294 square kilometers. In 1883 the entire population of this vast region was but 108,352 souls. As 10,861 were in the single city of Ciudad Bolivar, and at least as many in the gold regions near it, and many thousands of the subjugated but scarcely civilized Indian tribes were included in the census, the remainder must constitute an exceedingly sparse

population, so much so that the population of Caura on 58,458 square kilometers seems not to have been counted at all, but included in that of the State of Bolivar. It is difficult to estimate the area and population north of the Orinoco and Apure. The greater mass of the population lies upon the comparatively narrow rim of the Republic in the elevated regions bordering on the Caribbean Sea and Lake Maracaibo, which extends southwardly to the slopes of the Andes.

The obviously leading thoughts of both the rulers and the business men of Venezuela are to connect its populous and productive uplands with the Caribbean sea-ports by railways. Those uplands occupy precisely the relations to those ports which the eastern ports of the Mississippi Valley do to the Atlantic sea-board except that the lines of communication between the former must be from north to south. A railway is already in successful operation from La Guayra to Caracas and a few miles beyond. Mr. Bird, United States consul at the former place, suggests in his report of May 1, 1884, that it should be extended through the mountains southwardly to the Orinoco valley. From Puerto Cabello a railway is in course of construction southwardly to Valencia, and the late very progressive ruler of Venezuela, General Guzman Blanco, made Government contracts for the construction of a railway from Grita in the heart of the mountains in the State of Los Andes, down to Lake Maracaibo. After the successes of our own engineers in overcoming the obstacles of our Rocky Mountains, the Andes in Peru, and even in the short line which has been built in Venezuela itself around the 8,000 feet high mountain between La Guayra and Caracas and of European engineers in Switzerland and India, it is a question only of energy and capital how long it will be before all the really salubrious parts of Venezuela will be connected by railways with the ports on the Carribbean Sea.*

The following is a brief statement of railroad building in Venezuela taken from the Statistical Annuary of Venezuela for 1887:

Railways open to traffic.

	Miles.
From Caracas to La Guayra	23.6
Tucacas to Aroa	55.8
La Ceiba to Sabana Mendoza	25.1
Caracas to El Valle	3.4
Marquetia to Macuto	4.3
Carenero to Rio Chico	19.8
Caracas to Petare	6.2
Caracas to Antimano	5.5
	143.8

Railways in construction.

From Puerto Cabello to Valencia	33.5
Petare to Santa Lucia	27.3
Santa Cruz to La Fria	55.8
Orinoco to Yuruari	124.0
Barcelona to the Coal Mines	11.8
	252.4

Lines contracted and being studied.

From Caracas to La Victoria	62.0
Petare to Ciudad Bolivar (through Guarenas, Guatire, Rio Chico, etc.)	449.5
Puerto Cabello to Zamora	186.0
Maracaibo to Cojoro	96.1
Coro to La Vela	7.4
San Cristobal to Uribante	49.6
La Luz to Barquisimeto, Tocuyo, and Trujillo	217.0
Merida to Mucuchies and Bobures	161.2
	1,228.8

A French company has recently acquired a concession to build a railway from San Carlos del Zulia to Merida, and to operate a line of steamers in connection with it between San Carlos on the Escalante and Maricaibo.

Most of these railways have obtained guarantees from the Government of 7 per cent. interest upon their capital proportionate to the cost of the road, to continue for ninety-

* Report of South American Commission.

nine years; and some have a further grant of authority to work all mines within a certain distance of their lines. These railways have all been constructed by British capital.

The statistical annuary of Venezuela for 1889 makes the following statement: There are completed to the present time (July 1, 1889) 316 kilometers (196 miles), of which 37 kilometers (23 miles) are from Caracas to La Guayra; 8 kilometers (4.9 miles), Marquetia and Macuto; 5 kilometers (3.1 miles), Caracas and El Valle; 54 kilometers (33.5 miles), Puerto Cabello to Valencia; 90 kilometers (55.8 miles), Tucacas and mines of Aroa; 35 kilometers (21.7 miles), La Ceiba and Sabana de Mendoza; 19 kilometers (11.8 miles), Barcelona and Bay of Guanta; 33 kilometers (20.5 miles), Carenero to San José; 20 kilometers (12.4 miles) are in the Central Railroad; 15 kilometers (9.3 miles) in the great railroad of Venezuela. The Central is to be 240 kilometers (144.8 miles) long from Caracas to Valencia. The great railway will be 300 kilometers (186 miles), and will connect Caracas with San Carlos in the state of Zamora.

RAILROADS IN VENEZUELA.

On the 16th ultimo the railroad between this port and Valencia was formally opened by President Hermogenes Lopez.

The *Puerto Cabello and Valencia Railroad*, as it is called, was commenced a little more than two years ago by Perry, Caruthers & Co., of London, contractors. On the 1st of April it will pass into the hands of the company, of which Mr. W. Mallon is general manager. The gauge is 3 feet 6 inches—6 inches wider than the track between La Guayra and Caracas.

The distance is 54 kilometers. Valencia, the southern terminus, is a city of some 40,000 people, and is situated in the heart of one of the richest agricultural regions in the country. In fact, it is admitted that the States of Carabobo and Lara are the first in agricultural development in the entire republic. Another railway, from Caracas to Valencia, about 300 kilometers in length, is in process of construction by an English company. It is reported that Krupp, of Krupp gun fame, has a concession for still another railway between the two cities mentioned above.

Another railway is projected between this port and Aurare, which is not far from the Apure River, one of the principal tributaries of the Orinoco on the north. This is also about 300 kilometers in length.

There is still another line of railway—already commenced—in this consular district, extending from *La Luz to Barquisimeto*, a distance of 85 kilometers.

These lines will open up a great agricultural and mineral district, facilitating greatly the movement of merchandise to this port, and will doubtless build up and develop the country's resources more largely, and materially improve and advance the interests of the people throughout the entire country, and will be the best means of placing the Government on a much more stable basis than it has ever had. (Report by David M. Burke, United States consul, Puerto Cabello, March 15, 1888.)

Consul Plumacher, under date of February 5, 1889, reports that the Credit Mobilier of Paris has commenced preliminary work upon a road from La Fria to San Cristobal. The chief engineer, M. Dubosques, died from yellow fever almost upon arrival at La Fria, which will probably delay operations. Another road from the city of Merida to the lake coast is about to be begun.

A railway from Santa Barbara, at the southern extremity of the lake to San Cristobal will be commenced within a month, the contractors being a French company. No railroad in Venezuela will excel this in importance, and it has been talked about for many years, but there is every reason to believe that it will now be vigorously pushed through to completion. (Report by E. H. Plumacher, United States consul, Maracaibo, February 20, 1889.)

Referring to previous dispatches from this office respecting the projected railway from Lake Maracaibo to the city of Merida, I now have the honor to report that the work has already commenced, the contractors being a company formed in Paris with the title of "Compagnie Francaise des Chemins de fer Venezuéliens."

The original concession was granted to the Duke of Morny, son-in-law of General Guzman Blanco, who transferred his privileges to the above mentioned company. The engineer in chief, with a complete staff and a large amount of material, arrived in this city last month, and the preliminary work has already begun. When the terms of the contract became generally known, however, there immediately arose a strong opposition on the part of the people who, although fully appreciating the incalculable advantages of direct railway communication between Lake Maracaibo and the rich coffee regions of the Cordillera, were very unfavorably impressed with the extraordinarily exceptional privileges granted to the contractors.

I inclose translation which appeared in the Fonografo, a leading Maracaibo newspaper, giving a tolerably accurate idea of the general feeling of the people. It is true that all railways constructed in Venezuela have been favored with a guaranty clause in the contracts, assuring to the contractors an interest of 7 per cent. upon the capital invested, but it is complained in this case that the estimate of the cost of construction is excessive. Of the 170 kilometers comprised in the line the first 60 have been estimated to cost $60,000 each and the remaining 110 $70,000 each.

It must be acknowledged that the conditions topographically and otherwise are peculiar, as one part of the road will pass through swamps and morasses and another will necessitate heavy rock work in order to climb the Cordillera; but even taking all this into consideration it is to be regretted that American capitalists did not take this enterprise in hand. For years this consulate has called attention to its importance and to other opportunities for successful investments, but these suggestions have been utilized almost invariably by foreigners and not by Americans, for whose knowledge and benefit they were intended.

In this consular district there is now one railway in active and successful operation (that of La Ceiba), which will probably soon be extended to Valera by a French company. The Merida road is French property, and there is still another about to be constructed from one of the tributaries of the lake to the city of San Cristobal, also under a French contract. We are thus losing constantly excellent opportunities of augmenting our commercial prestige in this Republic. The French, particularly, have recently shown much activity in Venezuelan enterprises, and the only coal deposit where serious efforts have been made for the extraction of the mineral is granted to a Paris company.

In this connection I beg to state, as indicative of the interest taken by Europeans in these matters, that my report of February 3, 1888, referring to commercial and industrial matters in this consular district, published by the Department, attracted the attention of the British Government, and the foreign minister recently sent a personal cablegram to the British consul at this port, requiring detailed information respecting the petroleum deposits referred to at length in my above mentioned dispatch.

It would be gratifying to me were our own people to take advantage of these numerous opportunities for the enterprises of railways, coal mines, petroleum deposits, etc., but as it has often been mentioned in consular reports from various parts of South America the information thus furnished for the benefit of the capitalists, merchants, manufacturers, and exporters of the United States is acted upon more by Europeans than by our own people.

To return, however, to the railway, which is the immediate subject of this dispatch, I shall endeavor to keep the Department informed as to its progress and chances of completion. There are other details in connection with the enterprise, such as the alleged exclusive privilege of steam navigation on the lake, which are not yet sufficiently clearly defined for me to inform the Department with accuracy, but I think I can safely say that such a monopoly can not possibly exist, especially as it would conflict directly with the interests of an American company chartered and incorporated in New York. (Report by E. H. Plumacher, consul, Maracaibo, March 8, 1889.)

I have the honor to furnish the Department with further details respecting the progress of the railway from the lake coast to the city of Merida, as referred to in my dispatch No. 574, of March 4, last.

In January last the chief engineer, Mr. William H. Burr, an Englishman, and a staff of assistants, principally Americans engaged in New York, together with an English physician, arrived at Maracaibo and began the organization of the work. The circumstances attendant upon the concession for this enterprise were somewhat peculiar, and a brief résumé thereof will be of interest to those of our own countrymen who may contemplate similar enterprises in this Republic.

When the question of a railway from the lake shore to Merida was first seriously discussed, Guzman Blanco was then supreme in Venezuela and in actual possession of the presidency.

His son-in law, the Duke de Morny, visited this country immediately after his marriage, and was at once granted various valuable concessions, among them one for the construction of a railway from San Carlos, a river port at the extreme south of Lake Maracaibo, to the city of Merida.

This concession was granted by the executive power, needing only the approval of Congress to render it valid. As for nearly twenty years, however, the will of Guzman had been the law of the land, and as the national legislature had never hesitated to approve all of his acts without discussion, it was taken for granted that this railway contract of de Morny would be at once confirmed, although its terms were highly disadvantageous to the country and proportionately favorable to the concessionaire.

In a previous dispatch I pointed out the just grounds of the people at large against the issue of a contract based upon such unequal terms, and inclosed newspaper arti-

cles referring to the matter, in which both Guzman and his son-in-law were severely handled. However, as time elapsed the reaction against the dictator took place, and the present incumbent, Dr. Rojas Paul, succeeded to the Presidency. Congress met, and most of the contracts made by General Guzman Blanco were disapproved, but this particular concession for the Merida road was not submitted, its supporters fearing, no doubt, that in the existing temper of Congress and on account of the force of public opinion it would meet a like fate.

In the meantime De Morny had formed a company in Paris, he and his father-in-law, it is said, being heavy stockholders, and this company contracted for the construction of the road with the Compagnie de Fives-Lille, a French firm whose operations extend over the greater part of the civilized world. This latter company, it will be understood, are merely the constructors, having engaged to build the road for a stipulated sum, and have nothing whatever to do with questions of concessions or ownership.

It will be noted from the foregoing, however, that the contract is not yet approved, and if, in February next, when the Venezuelan Congress meets, it should be thrown out, then the company formed by the Duke de Morny will be obliged either to suspend operations after having already expended a large amount of money, or to continue at their own risk without the Government guaranty of 7 per cent. upon outlay, which is the backbone of the concession.

Of course it is impossible to prophecy what Congress may do, but it is certain that if the contract should be approved it will be greatly modified, as the estimated cost of the road, as accepted by Guzman Blanco, and upon which the 7 per cent. guaranty must be given by this Government, is scandalously in excess of even the most generous computation.

From the very beginning this project has been viewed but coldly by the Venezuelans, and with reason. As the traffic between Merida and Maracaibo is comparatively insignificant, the former city being situated in the poorest part of the Cordillera, it is difficult to see how a fair interest above running expenses can possibly be obtained upon the capital invested, and for many years, should the concession be finally approved, the people of this country would be taxed to maintain a line which really offers but few advantages, and the whole affair has borne such an unmistakable odor of a job in favor of the contractor that the only friends of the project are the few who for various reasons may be directly interested.

It is true that a railway from Lake Maracaibo to the rich coffee regions of the Cordillera is a necessity, but Merida is the worst possible point that could have been selected, and the projected road from San Cristobal, the seat of one of our consular agencies, to which I will have the honor to refer in a subsequent report, will fill all the present needs of the situation.

Notwithstanding the unpopularity of the Merida contract and its lack of final approval by Congress, it was determined to begin work and trust to the influence of Guzman Blanco to straighten out all difficulties, and in January last, as previously stated, Chief Engineer Burr arrived as representative of the construction company, and it is to the result, or rather want of result, of the operations of the past ten months that I desire to call attention.

These details may not appear of great interest, but will be appreciated by railroad men at home who may some time be engaged in similar enterprises in this country, and, as one of the results of the Pan-American Congress will be to call particular attention to the South American Republics and the fields there offered for the enterprise and capital of our people, it seems to be especially appropriate just now to explain clearly the industrial situation.

The history of the Merida road, from the beginning of the work up to the present, is simply a record of mistakes in administration and management.

The starting-point of the railway is at the town of Santa Barbara, situated on the river Escalente, 30 miles from its month, which latter is at the southern extremity of the lake, about 100 miles from Maricaibo.

The chief engineer established his headquarters in this city, where he has remained almost constantly, exercising no personal supervision over the work.

For convenience of survey the line was divided into two sections, the first from Santa Barbara to the foot of the mountains, and the second from this latter point to Merida.

The first section, comprising an almost level plain, was placed in charge of Mr. J. T. McGauran, a well-known New York engineer, and the second under control of Mr. C. Corner, with a corps of American assistants. The personnel of the staff appeared to leave nothing to be desired, but nevertheless ten months have elapsed, a large amount of money has been expended, and comparatively nothing done. Want of personal inspection on the part of the chief engineer may have been at the root of the matter, as, without being actually present at times in the field, it has naturally been impossible for him to keep thoroughly posted as to the necessities of the situa-

tion, and enterprise, as far as the practical part is concerned, may be considered acephalous.

This had its natural result, dissatisfaction ensued among the assistants, several of the American engineers having presented complaints at this consulate for non-fulfillment of details of contracts made with them in the United States and for other reasons, many of these complaints being, no doubt, well-founded.

The work progressed very slowly and unsatisfactorily, and to-day, more than ten months after the initiation of the surveys, they are not yet completed, although the entire distance is but 30 leagues. It will be remembered, moreover, that this is a climate of perpetual summer, where inclemency of weather is not a factor in the consideration of obstacles. It will seem almost incredible to our railroad people in the United States that, with ample funds and competent engineers, ten months have not sufficed to complete the survey of less than 100 miles, one-half of that distance being a level plain.

In the mean time the company in France has dispatched many ship-loads of rails, locomotives, etc., expecting that at least the first section would be entirely finished and trains running before now. The fault has been want of administrative judgment, and the working staff as first organized has now gone to pieces, and within the past few days a large party of engineers (all French) have arrived to replace vacancies. Mr. Burr, as far as is now known, still remains as chief engineer, although some of his former subordinates have made complaints against him to headquarters at Paris. It is true that in this country the administration is much more difficult than at home, but in the matter of the Merida road there has been such an absence of good judgment and administrative tact as to serve as a warning to impresarios in the future.

Lake Maracaibo is fed by about one hundred and fifty rivers, each one extending far inland, making the circumference of the lake an almost continuous swamp, with occasional stretches of solid ground between the river systems. It will therefore be readily seen that a railway from the Cordillera could not possibly arrive at the city of Maracaibo except by an enormous expenditure of money, far in excess of the most costly works of a similar character in any part of the world. A convenient port on one of the lake tributaries must be selected as a terminus, and from there steamers must connect with Maracaibo. This naturally necessitates a system of lake and river navigation in connection with the railway, and, recognizing this fact, the contractor was ill-advised enough to have a clause placed in the concession giving him the exclusive right of lake navigation. The absurdity of this is evident when it is considered that hundreds of sailing vessels have for generations traversed the lake and rivers, giving employment to thousands of people, and that there already exist various steam-ship lines, some under American charter. Appreciating this, the company formed by de Morny hastened to explain that this exclusive privilege only extended to steam navigation, which is also a ridiculous assumption, as for years American companies organized in New York and doing business under Venezuelan license have been actively engaged in the navigation of the lake and its rivers, and their exclusion would now bring about an international question.

It is much to be regretted that our own countrymen have not taken part in railway matters in this Republic, and the general opinion, as freely expressed in this section, is to the effect that if the Merida road, with all its natural drawbacks and unpopularity, had been from the first under American control the result to-day would be very different.

As the case now stands, time and money have been wasted, the prestige of the constructors has received a severe blow, and the only thing tangible to show for so many months of work and such a large outlay is an incomplete survey and a few hundred yards of track laid at the village of Santa Barbara. It is expected that the recent arrival of the new staff from France may bring order out of chaos; but a very different system must be adopted, and even should the survey and construction now proceed satisfactorily, yet it is doubtful whether Congress, in its session of February next, will approve the concession, even under modified and more reasonable conditions. (Report by E. H. Plumacher, U. S. Consul, Maracaibo, December 6, 1889.)

ECUADOR.

This country may be said to consist of three parts—the western slope, the Quito Valley, and the Napo region, so formed by the two Cordilleras of the Andes traversing the country from north to south. The Quito Valley having a general elevation of 7,000 feet is separated into three parts by lateral ridges, called sierras; the first, on the south, contains the cities of Loja and Cuenca and is about 50 miles in length; the middle basin, about 130 miles in length, is rather barren, and has the cities of Riobamba, Ambato, and Tacunga; the third and most northerly, in which is situated *the city* of Quito, the capital, is rich and fertile.

The Napo region is a dense primeval forest, broken only by rivers. There is not a good road in the whole province, and it is very thinly inhabitated. The Andes slope rapidly both in this region and on the western coast.

The river system consists of the Napo, Pastassa and Santiago, tributaries of the Maranon, and the Mira, Esmeraldas, and the Guayaquil flowing westward into the Pacific. The waters of the Quito Valley proper flow into the Pacific, while at Ambato the Pastassa flows into the Amazon.

The rainy season on the eastern slope is from March to November, with the greatest rain in April. The mean annual rain-fall at Quito is 70 inches, while at Charleston, S. C., it is only 46 inches, and at New York 42 inches. The mean annual temperature of Quito is 58. 8°, the extremes in a year being 45° and 70°.

During this season the rains are frequent, giving rise to the great rivers, the Napo, the Pastassa, and their many tributaries flowing into the Amazon. The Maranon at Nauta is three-fourths of a mile wide and flows at a rate of 3½ miles an hour. The Putumayo, which rises in Colombia and enters the Amazon below the Napo, has several mouths, one of which is a mile in width.

The population of Ecuador is given at about 1,000,000, of which the capital, Quito, has about 70,000, Cuenca, 30,000; Guayaquil, 40,000. The greater portion of the whole population is on the central plateau.

The western slope is mountainous, the coast having several harbors, the great port of entry being Guayaquil, whence merchandise is carried by rail or mules to the interior. There is one main road to the plateau which in the rainy season is very difficult of passage, but along the plateau there is a good road. Several passages from the central plateau through the mountains have been followed to the headwaters of the Amazon, one down the Pastassa River is difficult because of the rapids, another by way of Loja to the Maranon is also difficult. There is a road to Macas which is little used. The best route is probably from Quito to Papallacta, about 40 miles east-southeast from Quito, across an extreme elevation of about 14,000 feet, by a road just passable for horses, thence to Napo village, Archidona and down the Napo River. Papallacta lies on the western edge of the great forest. The old maps show the great Spanish high road traversing Ecuador from Colombia on the north to Peru on the south, touching all the important towns in the central plateau.

RAILWAYS.

In the report of the South American Commission it is said that "Finally the President thought the building of a railroad from Guayaquil to Quito would be a remunerative enterprise. The commerce of the country passes through Guayaquil, and it is the most advantageous point from which the interior can be reached. The road would be about 160 or 170 miles in length from the head of navigation on the Guayas River, and he estimated its cost at not over $4,000,000 in gold."

Communication between Quito and the Amazon is not difficult, and if opened up would no doubt make Quito a thriving city.

The Yaguache Railway, from Yaguache to Chimbo, 40 miles, with an extension from Chimbo to Sibambe, 50 miles, almost completed. This is the only railroad in operation in Ecuador, and is owned by the Government. The construction was begun in 1872 and the line opened to Chimbo in 1877; the original intention was to build to Quito on the north and Guayaquil on the south. A concession has recently been made for the construction of the line eastward from Yaguache to Duran, 14 miles, a point nearly opposite Guayaquil on the other side of the river.

A telegraph line from Guayaquil to Quito over this route was completed in August, 1884.

Other concessions have been granted for railways in Ecuador as follows: From the port of San Lorenzo to Ibarra, about 30 leagues, or 90 miles, the concession being for ninety-nine years, when the line reverts to the Government, and 6 per cent. being

guaranticd ; from Machala to Azogue and Cuenca ; from Manabi (or Bahia) to Quito; and in the Province of Rios from Baba to Vinces and Puebloviejo.

A survey is reported to have been made on the Bahia-Quito line.

RAILWAY PROJECTS IN ECUADOR.

In 1885 the Government made a contract for the construction of a section of railway from Chimbo to Sibambe, 50 miles in length, an extension of a railroad built some fifteen years ago by the Government from Yaguache, the head of navigation of a river of the same name, to Chimbo. For the construction of this extension the Government granted to the contractor, for twelve years, the income derived by it from the monopoly of the sale of salt in the Republic, amounting to 200,000 sucres annually, and the right to the use for his own benefit of the whole line for twenty-five years, he agreeing to complete the extension in four years. This year the contractor assigned his contract to a company of this city, known as the Railway and Public Works Company, which is now engaged in grading the roadway. Only a few miles have been graded so far. The Government has no share in the management of any part of the road. The direction from Yaguache to Chimbo is north, and from Chimbo to Sibambe east. From Yaguache, 25 miles northeast of this city, to Chimbo, the road passes through a fertile country, only sparsely populated, the chief products of which are sugar and rice. Several large sugar estates and a few small cocoa plantations are on the line of the road. The population is almost exclusively agricultural. From Chimbo to Sibambe, the terminal point contracted for, the road will pass through a mountainous region for the greater part of the distance, reaching at Sibambe an elevation of 7,500 feet. The country to be tapped by this section produces cattle, wheat, barley, and in fact most of the cereals and vegetables of the temperate zones, but the population is sparse, composed mostly of Indians, who are very poor and ignorant, though peaceable and laborious. The land is fertile and capable of yielding abundant harvests.

Last year the Government granted a concession for a railway from Duran, a point across the river and nearly opposite Guayaquil, to Yaguache, 14 miles west by land, to connect at that place with the road to Chimbo. For this the contractor is to receive from the Government 20,000 sucres a mile, and to enjoy the free use of the road for twenty years, at the expiration of which term it is to become the property of the Government; until then the Government will have no share in its management. Work has been progressing for the past year, and it is expected that the road will be open for traffic in December next. It runs through a low, flat region of country, devoted principally to the pasture of cattle and abounding in tropical fruits. The population is sparse and composed mainly of Cholos, a mixture of white and Indian, who bring the vegetable and fruit supplies to this city.

With the completion of the two lines or sections there will be a railroad of 96 miles, connecting Guayaquil and Sibambe (the latter a town of 2,000 or 3,000 inhabitants), and from thence there is a wagon road north to Quito, but it is much out of repair, and no wagon, I believe, has ever passed over it. There is some remote probability of an attempt, after the line reaches Sibambe, to continue the railroad to Quito.

A concession and subvention were last year granted for a railroad from Bahia de Carequez, a port on the Pacific, to Quito, about 280 miles east of the proposed line, the person undertaking to build the road to receive the net income of the custom-houses at Bahia and Monta, amounting to 70,000 sucres a year, for ninety-nine years, and to have the use of the road for the same period. The Government is to have no share in its management. For some 30 miles from Bahia eastward the projected road is through a level, flat country. Afterwards it enters the Andes and passes through a mountainous region, almost uninhabited. Some little grading has been done near Bahia, but it is thought to be a very difficult and costly enterprise and one not likely to be carried to a successful termination, with the wholly inadequate means at the command of the contractor. (Report by Owen McGarr, U. S. consul-general, Guayaquil, Ecuador, July 27, 1888.)

PERU.

GEOGRAPHICAL FEATURES.

Peru is perhaps the best known of all South American countries. It is the seat of the ancient civilization of the Incas and contains some of the famous silver mines worked for so many centuries. It is divided by its mountains into three regions—the coast, the central plateau, and the Amazon region. The coast line of Peru presents *an almost unbroken front* of arid ridges of sand or bleak ranges of rock running some-

times to the sea, yet behind those ridges and between those bare mountains are valleys of unparalleled fertility, through which wind streams of water fed by the unfailing snows of the highest peaks, streams whose volumes and force abate as they reach the wall of sand toward the sea and in which they are finally lost. There are few rivers of the multitude along the western slope of the Cordillera that find their way unbarred by sand to the ocean. In these valleys the products of the field are exuberant and varied, corn, cotton, sugar-cane, alfalfa, rice, with grapes, apples, pears, peaches, and other fruits abound. The maturity of the crops depend upon the time of sowing and planting, so that they may be arranged to mature consecutively, thus keeping the mills always at work.

The mineral resources of Peru are very abundant. Silver is found throughout her territory, also gold, coal, copper, and many other minerals.

The country is very favorable for the raising of wool, and it is only necessary to mention the guano and nitrate deposits to complete the list of the almost unlimited resources of this wonderful country.

The plateau is an agricultural country broken by many ridges. In the south is a portion of the great basin of Lake Titicaca, the remainder being in Bolivia; the whole is entirely surrounded by hills, thus cutting off all escape for its waters. North of this basin, in the valleys, flow the tributaries of the Amazon; on the plateau they flow due north, and then, escaping through the ridges, pour their waters into the Ucayali, the Huallaga, and the Maranon. These again, increased by the streams rising upon the eastern slopes of the Cordillera, enter the Amazon.

The greater portion of the population live on the central plateau, the Province of Jauja being the most thickly inhabited.

The Amazon provinces are thickly covered with vegetation, and are thinly inhabited. They are traversed in all directions by water-courses; the climate is mild, and the soil extremely fertile. In this country lies the head of navigation of the Amazon, beyond which the ways open to traffic are few, consisting of mule-paths almost impassible during the rainy season. The early Spaniards built extensive roads through the plateau, and it is said that the "Royal Highway" traversed the country from north to south. Along the coast there are also good roads, but across the mountains there are few passages. Several routes are used from the coast to navigation upon the Amazon, as previously mentioned, via the Maranon, Chachapoyas, and Huanuco, besides which there are no doubt others to reach the Purus and the Beni.

To overcome the difficulties of transportation and to give a market for the extensive mineral products railways have been extensively built and projected. The first efforts were towards the coast, and resulted in the construction of the Mollendo and Arequipa and the Callao and Oroya Railways; but recently others have been projected not only to the Pacific, but also to the eastward to reach the Pachitea, the Ucayali, and the Purus.

RAILWAYS.

Beginning at the north the railroads are as follows:

Payta to Piura, 63 miles; gauge, 4 feet 8½ inches; owned by the Peruvian Government; construction begun in 1872; total cost, $2,000,000. An extension of this line to a point on the Amazon River called Limon, passing through the provinces of Huancabamba and Jaen, and forming a route which is claimed to be the shortest yet projected in South America, between the Atlantic and the Pacific, was originally contemplated by the Government, and preliminary surveys were made; but owing to the recent disturbed condition of the country the project has practically been abandoned. Near Tumbez, about 20 miles north of this road, is the petroleum region, producing oil of good quality. East of it is a great sugar region.

Pimental Railway, from Pimental to Chiclayo, with branches to Lambayeque, Muchumi, Tucuma, Picsi, and Ferranafe; total length 45 miles, of which 30 miles are completed. This company has no subsidy, but has a monopoly for twenty-five years.

The completed portion, of narrow gauge, has been opened for several years, and cost about 1,000,000 soles. It passes through a rich sugar and cotton country extending along the coast about 100 miles and 60 miles inland.

Eten and Ferranafe Railroad, from Port of Eten to Ferranafe, 50 miles. The original concession was made July 3, 1867, to José A. Garcia y Garcia, and transferred by permission of Government, October, 1867, to a stock company. The road is of standard gauge and was opened in 1873.

Pacasmayo and Magdalena Railroad, from Pacasmayo to Guadelupe and Yonan, 93 miles. This road was built of standard gauge, and is owned and operated by the Government. An extension is proposed to Cajamarca, where it touches a beautiful grazing and farming country; it could be extended to the Amazon via Chachapoyas and Moyobamba. A portion was destroyed by freshets, because it had been located near the river, in which there is a tremendous current in the winter. Near its present terminus are rich silver mines.

Salaverry and Trujillo Railroad, from the port of Salaverry to Trujillo, capital of the Department of La Libertad, 85 miles. This road, of 3 feet gauge, was built by the Peruvian Government and opened about 1875. There are some coal mines farther on, and it is proposed to extend the road to them, but it can have no eastern outlet.

Chimbote Huaraz and Requay Railroad, Chimbote to Reqnay, 60 miles; gauge, 3 feet. The total projected length is 172 miles. The construction of this road was begun in 1870 by the Peruvian Government, which owns and operates it. It runs through a broken, heavy country, and touches what is said to be one of the richest mineral regions in Peru, there being silver and mineral coal beds on the line. The coal is bituminous and valuable for steam and gas; the supply is said to be sufficient for the whole Pacific coast, while the harbor of Chimbote is probably the best south of Panama.

Lima, Ancon, and Chancay Railroad, from Lima to Chancay, 43 miles; gauge, 1 meter. This road forms the first and second sections of the Lima and Huacho Railroad. It runs north from the right bank of the Rimac River (which flows through the center of the city of Lima), following and nearly parallel to the coast. It was built by a stock company and was originally projected to run to Huacho, about 25 miles beyond Chancay, but no work has been done on the last section for many years. The concession was afterwards annulled and the road acquired by the Government. Its total cost was $2,600,000.

Lima and Magdalena Railroad, from Lima to Magdalena, 5 miles; gauge, 1 meter.

Callao, Lima, and Oroya Railroad, from the port of Callao to Chicla, 86.5 miles; gauge, 4 feet 8½ inches. The construction was begun in January, 1870, by the late Henry Meiggs, under a contract made in December, 1869, with the Peruvian Government, which called for the completion of the whole line, Callao to Oroya, 135.8 miles, in six years. The contractor was to receive $27,600,000 for the building of the line, which then was to become the property of the Government. The road presents some of the most remarkable engineering achievements in the world. Over sixty tunnels, or an average of about one in every 2 miles, pierce the mountain in its path. Among these the most remarkable is the Galera, or Summit, Tunnel, 104.5 miles east of Callao, which is nearly 4,000 feet long, and is 15,645 feet above the sea-level. At Mount Meiggs the road reaches its highest elevation, 17,574 feet, from that point descending the eastern slope of the Andes to Oroya, 12,257 feet above sea-level. In addition to the large number of tunnels there are also about eighty bridges, the most important being the Agua de Verrugas Viaduct, 576 feet long and 253 feet high, constructed on the Fink truss plan.

In consequence of the great engineering difficulties which attended the construction of this line its cost greatly exceeded the original estimates, and when the road reached Chicla, to which point it has been opened for several years, the funds applicable to its construction had been exhausted.

A contract was made by the Government in 1885 (a copy of which is found in the Report of the South American Commission) with M. P. Grace to construct a railway between Oroya and Cerro de Pasco, which at the end of ninety-nine years shall revert to the Government. This contract included the unconstructed section of the Oroya Railway between Chicla and Oroya. The company was also to have the preference in the construction of railways from any part of the line from Chicla to Tarma and Chanchamayo. The section from Chicla to Oroya was to be completed in four years from the date of the contract, with a penalty attached for its non-completion.

All articles necessary for the completion and operation of the line were to be imported free of duty. To complete it to Oroya and Cerro de Pasco is 85 miles, and of this part much of the heavy work and tunneling is already finished Cerro do Pasco is the heart of the mining region. There is an immense basin 2½ miles in length and about 1½ miles in width, in which hardly a shovelful of earth can be turned without silver.

The highest point on this road is 15,684 feet, and the mines themselves are 14,300 feet above the sea.

This company owns the Cerro de Pasco Railway, running from the mines to their mill and the surrounding estates, used for the transportation of freight and passengers. The total projected length was 22 miles, of which 9 are built. The estimated cost was $1,300,000, upon which the Government guaranties 7 per cent., and work was begun in 1869, under a contract with Henry O. Wyman & Co.

It is proposed to extend this road to a point called Chanchacayo, the head of steam navigation on the Amazon, and preliminary surveys have been made. The entire distance from Callao to this point is only 210 miles.

A branch of the Oroya road has also been projected to Jauja.

Another railway to form a connection with the Oroya road has been surveyed under Government supervision from Cerro de Pasco to Port Salvation, 204 miles distant, on the river Pichis, a stream flowing into the Pachitea, one of the Peruvian headwaters of the Amazon.

Lima railways, from Callao to Lima, 8.5 miles, and from Lima to Chorillos, 9 miles; gauge 4 feet 8½ inches. These lines are owned by a British corporation, registered in 1865, to acquire and work two railways held under concessions from the Peruvian Government, the first section (Callao to Lima) of which was built by local capitalists under a concession granted in 1848, and the second (Lima and Chorillos) built by local capitalists under a concession granted in 1855. Original cost of both $1,200,000.

Pisco and Ica Railroad, from port of Pisco to Ica, 46 miles; with a branch to Macacona, 1 mile; gauge, 4 feet 8½ inches. This line was built by a private company, but afterwards purchased by the Peruvian Government. Its cost, $1,450,000, is represented by bonds bearing 7 per cent. interest, which has been in default since 1875. The road was formerly leased by Señor Boza.

At Ica there is a rich mining and agricultural region, silver, gold, and copper being found, but the great mineral product is iron. This valley is famous for its grapes, and is also prolific in other fruits. The mountains would make it difficult to extend this line to the eastward, but if extended to the southward it would pass through a very rich region. No surveys, however, have been made for this purpose.

Mollendo and Arequipa Railroad, from the port of Mollendo to the interior city of Arequipa, 107 miles, where connection is made with the Arequipa, Puno and Cuzco Railroad. The construction was begun in 1868, and the line was opened in 1870. The road was located by John L. Thorndyke, of New York, and is owned by the Peruvian Government, by whom it was originally leased to Henry Meiggs. The total cost was $2,000,000. The guage is 4 feet 8½ inches, and the rail steel, 63 pounds to the yard. The maximum grade is 4 per cent.; the minimum radius of curves 352 feet.

Arequipa, Puno and Cuzco Railroad, a continuation of the above line from Arequipa

to Puno, 217.6 miles, and from Juliaca to Santa Rosa, 32 miles, with sidings, etc., 41.5 miles. The gauge is 4 feet 8½ inches, the rail steel, 60 pounds to the yard; the heaviest grade, 4 per cent. The Puno division was opened in 1874, and the Cuzco division from Juliaca, in 1875. The latter was originally projected to Cuzco. A line of steamers on Lake Titicaca runs in connection with this railway from Puno to Chililayo, in Bolivia, 120 miles.

This road is owned by the Peruvian Government and was originally leased and operated by John L. Thorndyke, but by a recent contract it has been leased to M. P. Grace & Co., and is to be extended to La Paz in Bolivia.

Ilo and Moquegua Railroad, from the port of Ilo to the interior town of Moquegua, 63 miles, running through one of the richest wine-producing districts in the country. It was located by John L. Thorndyke, the construction begun in 1871, and opened in 1873, having cost in all $5,025,000. It is owned by the Peruvian Government. Gauge 4 feet 8½ inches.

In the work on the railways of Peru submitted with the report of the delegate from that country lines of railways between various parts of the country are discussed. Among the roads proposed, in addition to those above named, are the following:

From Chancay (on the Lima, Ancon and Chancay Railroad) to Cerro de Pasco; from Ica (Pisco and Ica railroad) to Ayacucho in the interior; from Tacna (on the Chilian road between Arica and Tacna) to Puno; from Trujillo (Salaverry & Trujillo) to Cajamarca and Eten.

On January 11, 1890, the Peruvian Government signed a contract with the Grace bondholders ceding for sixty-six years the railways from Mollendo to Arequipa and Puno, Juliaca to Santa Rosa, Pisco to Ica, Callao to Chicla, Lima to Ancon, Chimbote to Seechiman, Pacasmayo to Yonan and Guadalupe, Salaverry to Trujillo, Paita to Piura, with all the necessary land for their extension. The work contemplated is, first, the extension and repair of the existing railways at an estimated cost of $3,212,000, the extension of the Arequipa Railway from Puno, its terminus on Lake Titicaca, to Desaguadero, on the Bolivian frontier, by a narrow-gauge line; and second, to continue the line from Desaguadero to La Paz and Oruro, in Bolivia, at an estimated cost of $3,150,000. The existing revenue from railways is $6,300,000, which is to be available to the bondholders. Another concession in their hands empowers them to connect the Oroya Railway with the navigable waters of the Amazon by 180 miles of narrow-gauge road. Along with the contract mentioned there are cessions of valuable guano deposits.

PERU IN 1887-'88.

Foreign capital and enterprise are indispensable for the advancement of this country materially and in the way of business. The natural resources of Peru as regards mining, agriculture, wine growing, and cattle raising are unlimited, but find here no sufficient elements for their proper development, owing to inability of the Government to lend assistance and the general poverty everywhere experienced. And that capital and enterprise, certain to be richly rewarded, is withheld doubtless from the distrust entertained by foreigners as to the guaranties afforded to them in the investment of their means and the recent proceedings regarding certain railway contracts, based upon legal dispositions and perfected with properly-constituted Governments, are certainly not calculated to dispel such distrust. Some adventures of foreign capital have been made in mining enterprises. The famous silver mines of Hualgayoc, in the vicinity of Cajamarca, are now to be worked by an American company said to be well equipped with the means of successfully developing their undertaking, and the gold washings of Carabaya, near Arequipa, are in the hands of a responsible organization formed in London by the late Admiral Garcia y Garcia.

The Lima Railways Company, an English organization, recently sent to Peru the president of their board of directors, and this gentleman has been engaged in investigating the advantages of continuing the line connecting Lima with Chorilla to Pisco and Ica, 120 miles down the coast. This railway has been the subject of consideration for years past, and the general opinion is that from the immensely fertile region it would traverse, from whence the Lima and Callao markets could be

cheaply provided with provisions and meat, the undertaking would prove to be the most profitable, more particularly as the engineering difficulties to be surmounted are not formidable. No proposition has as yet been made to the Government, the decision of the London board having first to be heard; but it seems probable that the undertaking will be commenced. Owing to the complete service on the coast offered by steamers, the railways constructed or projected in Peru have had a route leading from the ports inland, and this possible departure from the customary plan is regarded with much interest. Another proposed railway has been surveyed, under Government supervision, from the Cerro de Pasco to Port Salvation, on the river Pichis, a stream flowing down to the Pachitea, one of the Peruvian headwaters of the Amazon. The road, if constructed, offers no especial difficulties, and would form a connection between Cerro de Pasco, the ultimate terminus of the Oroya Railway, and a point on the Pichis, 204 miles distant, where steamers drawing 3 or 4 feet of water can readily arrive, and then proceeding down to the Pachitea, carry the valuable products of that region, principally India rubber, dye-woods, fruit, etc., to markets on the Amazon and beyond. This road, when completed and connecting with the projected prolongation of the Oroya to the Cerro de Pasco, would open up the rich Amazonian region to enterprise from this portion of the Republic, communication between the two points at present being so difficult of accomplishment and so expensive as to prevent all profitable trade.

During the past year the Government at Lima has formed several military colonies composed of half-pay officers and veteran soldiers, which have proceeded to the country near the Pachitea for the purpose of founding settlements and opening up those districts to commerce. The information received from these expeditions corroborates the general descriptions regarding the natural wealth of those sections, and the Government is aiding the colonists with the limited means at its disposal.

The development and prolongation of the great railways, upon which such large amounts of money have been expended, depend upon the action to be taken by Congress regarding the proposals made by the bondholders of Peru abroad, whose capital has been employed in the undertakings, to the Government at Lima. To the general disappointment, and as the department was duly informed, this proposal, known as the Grace-Aranibar contract, was not acted upon by Congress at its last session owing to certain animadversions made against several of the clauses by the Government of Chili, and although the President at the opening of the Congress now in session did not refer to the contract in his inauguratory message, his silence is explained by the official journals of Lima from the circumstance that as not only the Chilian but the British Government has interested itself in the matter, the communication made by the Executive to the legislature, or to be made, must be of a reserved character. On the successful issue of this contract depends, it is believed, the future progress of Peru. Should it be ratified, the necessary capital for the completion of the railways would be furnished by the bondholders, who thus seek to promote their interests, becoming the holders of the roads for a long period of time and giving a participation of profits to the Government, and at the same time giving an opportunity for labor and assuring the industriously inclined of lucrative occupation. Before closing this dispatch it may be possible to report some action of Congress regarding the important matter.

Numerously-signed petitions from different portions of the country have been presented to the Government, urging the adoption of this contract, but, as has been stated, we are in ignorance at the present moment of its prospects of success. The British minister at Lima received information from his Government a short time since to the effect that Great Britain could not entertain the conditions desired by Chili which, it is thought, were of a nature seeking to introduce some dispositions regarding the territory of Arica and Tacna, held by Chili for a period of ten years, into a contract purely mercantile in its character, and the English cabinet desired Peru to be made acquainted with the favorable views it entertains respecting the proposed contract, by which the interests of British creditors would be assured and those of Peru certainly advanced. (Report by United States Consul Brent, Callao, June 30, 1888.)

BOLIVIA.

The topographical features of this country are much the same as those of Ecuador and Peru, so far as the plateau and the eastern slopes of the Andes are concerned. The Cordillera of the Andes is divided into two parts, between which lies the basin of Lake Titicaca, Lake Poopo, and their tributary streams. This basin has an altitude of 11,000 to 13,000 feet above the sea, and is 500 or 600 miles in length and from 60 to 150 miles in width. It is so surrounded by mountains that no water escapes except by evaporation. On its southern edge is situated the city of Potosi, the highest in the

world. Among other cities in Bolivia are La Paz, 60,000; Cochabamba, 14,700; Sucre, 15,500, and Oruro, 8,000. In this State are the richest silver mines in the world.

On the eastern slopes of the Andes sources of the Amazon flow northward across the plain of Mojos and of the La Plata flow southeastward into the Atlantic. Of these are the Beni, Mamoré, and the Guapore flowing northward into the Madeira; the Pilcomayo and its tributaries emptying into the Paraguay. The plain of Mojos merges into the table-lands of Matto Grosso in Brazil, which separate the sources of the Amazon from those of the Paraguay and Parana. Canoe navigation is carried into the heart of the country; other transportation is by mules, for there are few roads that can be used by wheeled vehicles, especially during the rainy season. The falls of the Madeira alone prevent large boats from ascending the Mamoré a long distance; to overcome this a railroad has been projected around them in Brazilian territory. The principal road extends from Puno in Peru to La Paz, the capital of Bolivia, proceeds southward near the shores of Lake Aullagas through Oruro to Potosi and thence to Tupiza, with branches to Sucre, Cochabamba, and other cities.

Exports find their way out of the country to the eastward by the water-courses, on the north by Lake Titicaca and the Peruvian Railroad to Mollendo, on the west and south by land transportation.

RAILWAYS.

It will not be long before Bolivia will have an extensive railroad system. The railway, of narrow gauge, from Antofagasta has just been completed to Uyuni, 379 miles. The same company has contracted for the prolongation of this line to Oruro, a distance of about 198.5 miles. The Government has guarantied an annual interest of 6 per cent. upon a capital of about $3,000,000. Uyuni is about 16 miles from Huanchaca, 125 from Potosi, and 217 from Sucre.

A railroad is projected from Tacna, the terminus of the Arica-Tacna Railway, to Corocoro or to La Paz, about 250 miles. This will be difficult of execution because of the abruptness of the mountain slopes; at present there is a mule road between these points, over which much traffic passes.

A concession has been granted for the extension of the Arequipa-Puno Railway in Peru, to Desaguadero, and from there to La Paz, the capital of Bolivia. It is to be extended to Oruro, where it will join the line from Antofogasta. From Oruro a branch is projected to Cochabamba.

The Central Northern Railway of Argentine is to be extended from Jujuy to the Bolivian frontier, whence it will be easy to continue it to join the Bolivian line at Uyuni.

Another important project is for a railway from the Paraguay River to Santa Cruz and Sucre.

Besides these lines, which have the important object of giving outlets for traffic beyond the borders of the State, there are minor projects which while serving the same purpose are of great value for internal commerce, as follows: From Santa Cruz to the Rio Grande, from Cochabamba to the Rio Chimoré, and from La Paz to the river Beni. There is a line of telegraph from the Argentine frontier through Potosi, Sucre, Aruro, and La Paz to Chililayo on Lake Titicaca, and another to the Pacific coast.

Till within a few years, the vast agricultural and mineral resources of the country were entirely dormant for want of means of communication, but more recently an attempt has been made to construct roads and railways. The silver mines of Potosi alone are estimated to have produced 600,000,000 sterling from their discovery in 1545 down to 1864. The Indian rubber supply of Bolivia is of the finest quality and almost inexhaustible. Cocoa is one of the most important products of Bolivia; in 1884–'85 the quantity derived was valued at £343,660; and cinchona is another important culture; a report of the United States consul, referring to 1884–'85, estimates the number of trees at five millions and the quantity of bark produced in the year at 200,000 pounds. (Stateman's Year Book.)

Besides those mentioned other exports are coffee, copper, tin, and cubic niter. Two-thirds of the exports consist of silver.

CHILI.

This country, consisting of the territory between the mountains and the Pacific coast from Peru southward for about 1,800 miles, has been well covered by railways, and was the first of South American countries to build them, having opened the one from Caldera to Copiapo in January, 1852. The first railways were built from the sea-coast towards the interior, and afterwards extended in all directions until the country is united throughout. This is strictly true for the southern part, and in the north a railway is projected which will give almost unbroken communication throughout the entire State. Two transandine lines are under construction and will be finished at an early day, one from Valparaiso, across the Uspallata Pass at an elevation of 10,600 feet, with a tunnel several miles in length, to Mendoza and thence to Buenos Ayres, 870 miles, the other from Zumbel in Chili to Bahia Blanca. To these might be added the Antofogasta line, which will soon be completed to Huanchaca in Bolivia, where it will join the line under construction from Buenos Ayres, thus forming a transcontinental line. Another has also been spoken of from San Antonio on the Copiapo Railway, crossing the Andes at 27 degrees south longitude, following the Jorquera, Turbes, and Cachelos Rivers, ending at Pucha Pucha on the Argentine frontier, and another from Conception to Buenos Ayres.

On the line now being constructed, the grade in some portions is 422 feet per mile, to overcome which the Abt rack-rail system is to be used.

A table is given in the report of the delegate from Chili, from which I extract the following:

Lines of railroad built and owned by the state.

Termini.	Kilometers.	Average cost per kilometer.
		Gold.
Santiago to Valparaiso	187	$69,781
Santiago to Curico	185	32,171
Curico to Chillan	210.9	28,412
Chillan to Talcahuano	187.5	26,436
Andes Branch	45	22,783
Palmilla Branch	39	9,820
San Rosendo to Angol	73	28,070
Angol to Traiguen	72	55,982
Santa Fé to Los Angeles	22	28,070
Renaica to Fort Victoria	75	55,982
Robleria to Collipulli	42	.....
Chanaral to Animas and Salado	60	5,842
Total (743 miles)	1,198.4	

The total receipts for 1887 were $6,349,621.20 and the expenses $4,197,250.66, leaving a clear gain of $2,152,370.64.

Of private lines there are quite a number, aggregating 1,000 miles, and the Congress has recently approved a contract made by the executive with Mr. Newton B. Lord for the construction of ten lines, aggregating 608.84 miles, the total cost of which will be about $17,500,000, the average cost per mile being $28,700, more or less. I have found a description of these in the Engineering News which is here given in full:

THE NORTH AND SOUTH AMERICAN CONSTRUCTION COMPANY IN CHILI.

The roads which are to be constructed by the North and South American Construction Company are briefly analyzed as follows, beginning at the most northerly one, by Col. S. H. Lockett, who was one of the representatives of the syndicate in securing the concession.

(1) Road from Huasco to Vallmar, 1-meter gauge, 50 kilometers long; starts at the port of Huasco, a village of about 1,000 inhabitants, lying on a bluff near the

month if a small river, whose waters coming from the melting snows of the Andes sometimes find their way to the sea, but are generally exhausted in irrigation or lose themselves in the sandy river-bed. Huasco has quite an extensive copper smelting works. The harbor is considered is fairly good, but a mole is needed, and is one item of the consideration for the railway. The road runs up a level, cultivated valley with but very slight irregularity of surface, crosses the river once on an unimportant bridge, terminates at Vallenar, a town of between 5,000 and 6,000 inhabitants; climate good; valley fertile and fruitful.

2. Road from Ovalle to San Marcos, is 1-meter gauge, 60 kilometers long; is prolongation of a road now in operation from Coquimbo to Ovalle, a town of 5,500 souls. The route follows the valley of the Limarí River, cutting across the spurs of hills, giving rise to some deep, but not long, excavations and fills; considerable amount of rock cutting, but nothing that would be called difficult work; one important bridge across the Limarí River of 210 meters length; numerous small bridges, culverts, and trestles across the irrigation canals and small runs from the side hills; climate good; valley fertile. Coquimbo, the landing place, is considered the best port of the entire coast.

3. Road from Los Vilas to Illapel and Salamanca, starts from the port of Los Vilas, where there is a mole, takes a sharp curve around a lake back of the port and returns to the coast, skirts along the coast, crossing sand dunes and mouths of gulches, coming around or cutting through rocky head lands till it arrives at Huantelauquen, a distance of 5.5 kilometers. This is a somewhat difficult portion of the line to construct, and will be more difficult to keep in good condition.

At Huantelauquen the road turns up the narrow valley of the Choapa River, one branch following this river to Salamanca, the other to Illapel on a stream of the same name. Both streams have rocky spurs to be skirted or cut through. There will be gradients of 2 per cent. and numerous curves, so that the entire line may be designated as "heavy work." The valleys are fertile and the mountains rich in silver, copper, and gold; climate good. There will be two bridges of 60 meters span, one of 40, and numerous smaller ones.

4. Road from La Calera to La Ligua and Cabildo, 77 kilometers, 1-meter gauge, starts from La Calera on the Valparaiso and Santiago line, crosses the Aconcagua River on a bridge of 300 meters length, and follows the valley of the Melon 16 kilometers; winds up the "quebrada" (cañon) of Collague until at the twenty-fifth kilometer it is 556 meters above the level of the sea; here crosses the Sierra del Melon by a tunnel nearly 1,000 meters long; winds down the northern slope of the Sierra and reaches the valley of La Ligua at an altitude of 69 meters above sea level, then follows the valley on an easy line to its terminus at Cabildo. The gradients in crossing the "quebrada" are as high as 3 per cent.; curves are numerous; one hundred and twenty-three culverts and small bridges, one bridge 200 meters long, and three others of a more or less importance. Being in the heart of Chili, the line has favorable conditions for securing labor, plant, etc. The heaviest work of all the lines is on this one.

5. Road from Santiago to Melipilla, 59 kilometers long, 1.68-meter gauge, follows the rich fertile valley of the Mapocho River, presents no difficulties, has one bridge of 252 meters in length.

6. Road from Palmilla to Alcones; 45 meters long, 1.68-meter gauge; is a prolongation of a branch of the main trunk line south, runs through a level and undulating country; presents no points of difficulty or of special interest. It is proposed to continue this ultimately to the coast, having Pichilemo for its terminus; this extension will cross the coast range and bring in some tunneling and other varieties of mountain work.

7. Road from Talca to Constitucion, 85 kilometers long, 1-meter gauge; starts from the important inland city of Talca, follows the river Maule on its north bank until it has reached a point nearly opposite to Constitucion, at its mouth; crosses the river by a bridge 280 meters long, which is much the most difficult work of the line. Following the sinuosities of a crooked stream, sharp curves are numerous, and deep, short cuts and corresponding fills of frequent occurrence, with considerable rock work. One tunnel 90 meters long is encountered.

8. Road from Peleqnen to Peumo, 35 kilometers long, 1.68-meter gauge, is a branch of the main trunk line running through a level country, having nothing of interest except a bridge across the Cachapoal River of 360 meters length.

9. Road from Coihne to Mulchen, 43 kilometers long, 1.68-meter gauge; a branch of the main trunk line running up the valley of a small stream with no elements of difficulty.

10. The road from Victoria to Valdivia and Osorno, 403 kilometers long, 1.68-meter gauge.

This is the prolongation of the grand central trunk line, follows the trend of the central valley, generally avoids hills and rough ground, but crosses numerous small streams and many of considerable size. About 20 miles from Victoria it enters the southern forest, a region comparable to the great forests of Oregon. Considering the

length of the line, the grading work will not be very heavy; but one short tunnel occurs, but the amount of bridging is proportionately very great. In addition to numerous small bridges, culverts, open and arched drains, there are forty-one principal bridges, varying between 50 and 250 meters in length, and ranging in height from 4 meters to 38 meters. The climatic conditions will present some difficulties, as the rains are copious and the rainy season prolonged.

The labor question will be one of considerable importance in the execution of works of such magnitude in a country whose population is only 2,500,000 people. But the liberality of the Government in providing for the introduction of foreign laborers and artisans has done much towards a solution of this problem. It might be mentioned here that a prevalent soil in Chili is the so-called *tosca*, or "hard-pan" of the United States.

Taking all things into consideration, there seems to be every reason for believing that the contract just made between the Chilian Government and the North and South American Construction Company will be fulfilled in the specified time of five years, to the honor and credit and profit of both parties.

When these are constructed the north and south line will extend, with the exception of one or two short breaks, for a distance of about 1,450 miles.

The following is a brief account of the private lines:

Angelo Chilian Nitrate and Railway Company.—This British corporation was registered in 1888 to acquire nitrate grounds in the Province of Antofagasta, and to construct railways and other works. By the terms of the contract the entire line from Tocapilla to the nitrate grounds, 60 miles, was to be opened to traffic by December 29, 1889.

Antofagasta and Bolivia Railway Company, formed for the purpose of acquiring from the Compania Huanchaca, de Bolivia, the concessions granted by the governments of Bolivia and Chili for the construction of railways and telegraphs from Antofagasta to Huanchaca, 395 miles, via Salinas, El Dorado, to the village of Calama, hence eastward to the borate deposits of Ascotan on the frontier of Bolivia, and thence to the silver mines of Huanchaca. The whole of the Chilian section, 272.8 miles, has been opened for traffic, and it was expected to complete the whole line in October, 1889. This line is to connect at Huanchaca with the Argentine line from Buenos Ayres, and will be extended to Potosi and Oruro, connecting there with the Peruvian line from Puno.

Arica and Tacna Railway, from the Port of Arica to Tacna, 39 miles, opened in 1854. This road is situated in territory acquired from Bolivia by the treaty of 1883.

Antofagasta Nitrate and Railway Company.—Projected line from Antofagasta to Chonchi, 185 miles, with branches, extensions, etc., 20 miles. The gauge is to be 2 feet 6 inches.

Antofagasta and Aguas Blancas.—A contract was recently signed by the Government with Mr. George Phillips for the construction of a railway with 1-meter gauge between these two points, and which is to pass through all the nitrate works between them, with branches to any others that may be established hereafter. Plans are to be submitted to the Government within three months, and work is to be commenced within four months after their approval.

Carrizal and Cerro Blanco Railway, from Carrizal to Yuerba Buena, with a branch from Canto del Aqua to Carrizal Alto, and other branches making the total length 50.2 miles. The extension up the Jarilla Valley, 20 miles, was completed in 1886. This road is owned by a British corporation formed in 1880 by the consolidation of the Carrizal Railway and the Cerro Blanco Railway.

Copiapo Railway, from Caldera to San Antonio, 93.6 miles, with branches from Pabellon to Charnacillo, 24.6 miles; from Paipote to Puquios, 31.6 miles; total, 150.0 miles, with sidings, etc., 19.2 miles. This is the pioneer road of the southern hemisphere. The company was organized in October, 1849, and the road was opened to Copiapo in January, 1852; to Pabellon, January 1, 1855, and to San Antonio, February 1, 1867. In 1868 the Charnacillo branch was purchased, and on January 20, 1871, the Puquios branch was opened. This road has been very profitable.

Coquimbo Railway, from Coquimbo to La Serena and La Compania, 9.3 miles; and

from Coquimbo to Ovalle, with branch to Panulcillo, 76.3 miles. This road was opened to Las Cardas and La Compania in August, 1862. Gauge 5 feet 6 inches.

Elqui Railway, from Serena to Elqui, 48.4 miles, opened in 1883. Gauge, 1 meter. Uses tracks of Coquimbo Railway from Serena to Compania, a third rail having been laid for that purpose between those points.

Laraquete and Moquegua Railway, from Laraquete to the coal mines of Quilachanquin and Moquegua, 24.8 miles.

Mejillones Del Sur and Cerro Gordo Railroad, from Mejillones to Cerro Gordo, 18 miles.

Patillos Railway, from Patillos to Salibreras Del Sur, 57.7 miles, projected to Lagunas, 10.5 miles further; total, 68.2 miles. This road is owned by a British corporation, and was built in 1872. Gauge, 2 feet 6 inches.

Pisagua Railway, from Pisagua to Tres Marias, 54.8 miles, with branches to Agua Santa and Puntunchara and sidings; total, 65.7 miles.

Iquique Railway, from Iquique to Tres Marias, 67.7 miles, with branches to Virginia, 19.2 miles; to Bodegas, with sidings; in all, 120.3 miles. This road connects with the Pisagua Railway. Both of these lines were built about twelve years ago, by private capital, to develop the nitrate mines. Guage, 2 feet 6 inches.

Taltal Railway, from Taltal to El Refresco, 18 miles. Branch projected to the Arturo Prot mines. Sidings, 3 miles. This road is owned by a British company, incorporated in 1881. Construction was begun in December, 1880, and the road opened October, 1882.

Tongoy Railway, from Tongoy to Tamaya, 33.1 miles; Tongoy to the smelting works in Tongoy, 1 mile; total 34.1 miles. Gauge, 3 feet 6 inches. This road was built in 1867, by a Chilian corporation established in 1865. An extension from Cerrillos to Ovalle, 20.5 miles, was projected and has been surveyed.

The South American Commission, in their report upon Chili, state that the experiment of governmental management of railways has not been a success. They also say that nearly all the railway supplies are obtained from the United States.

W. C. Quinby stated, in the testimony given before that Commission, that a road had been surveyed from Colon to Bogota, thence to Quito and Cerro de Pasco, and down to Cuzco and Argentine; that it was a preliminary survey, made probably from the maps and water-courses. He thought it would never be built.

AMERICAN RAILWAY BUILDERS IN CHILI.

The most interesting feature I have to report on this occasion, in connection with United States affairs here, is the letting of a Government contract for the construction of about 1,000 kilometers of railway to an American syndicate. The contract price is about £3,500,000, but, unfortunately, the agreement has been seriously affected by a sudden and unexpected advance in the price of exchange on London. When the contract was signed exchange fluctuated between 25*d* and 26*d*; but since then it has touched 30*d*, and is now fluctuating between 28*d* and 29*d*. It is estimated that an exchange of 30*d* would cause a loss to the contractors of about $3,000,000, and negotiations on an exchange basis to provide against a contingency, have been opened between the representatives of the syndicate and the Government. It is understood that the President of the Republic is desirous of making equitable concessions, and if this matter can be satisfactorily arranged there will be nothing, after the stipulated security of $1,000,000 for the fulfilment of the contract is deposited in this country, to hinder the contractors from commencing operations at once. The rolling stock for the new lines is to be mostly of American pattern, and, therefore, the probabilities are that this class of materials will be mostly procured from the United States.

This fact and these circumstances would seem to invite the attention and enterprise of our unequaled car builders. (Report by James W. Romeyn, U. S. Consul, Valparaiso, Chili, December 15, 1888.)

CHILIAN LOCOMOTIVES.

I have referred incidentally to the building in Chili of certain locomotive engines and cars for the State railways. I had lately the satisfaction of visiting and inspecting *unofficially*, of course, the extensive works of the contractors for the six locomotives,

Messrs. Lever, Murphy & Co., at Caleta Abarca, about 4 miles from this port. Mr. Lever is an Englishman, though formerly a resident of San Francisco. The firm have large capital, have been long established, and have done a great deal of work in repairs on United States vessels of war.

The wages of their employés, about four hundred and fifty in number (some 70 per cent. of native birth, the others English, Scotch, and Irish), run as high as $7, Chili money (nearly $4 gold), per day. The locomotives (two still in the shops in a forward state, the four others contracted for having been delivered, the first in December last) are entirely constructed here with the exception of the wheels, which are of English manufacture. The contract price was $40,000 each, about $21,000 gold. Eighteen months were allowed for the construction of all. The general design is the American with the American bogie, and with cylinders on the outside, instead of on the English plan. These cylinders are relatively larger than ours, 17 by 24. Certainly, the American engine is much the better adapted to the sharp curves of those mountain roads.

The machinery used by the constructors for this and other of their metal work is English; that for wood-working from the United States. Their steel is imported from England; pig-iron for castings, from Scotland. Through the kindness of Captain Saukey, an Englishman, but holding the appointment in the Chilian Naval Service of Inspector General of Machinery, I had the opportunity of inspecting the new steel boilers in construction at the same works for the Chilian steam corvette *Pilcomayo*, a wooden vessel built in England, captured from Peru in the late war. The contract price for these boilers (two) is $52,000 paper currency, about $27,000 gold. (Report by Jas. W. Romeyn, U. S. Consul, Valparaiso, Chili, February 29, 1888.)

ARGENTINE.

This country is level except in its most northern and western parts, which perhaps, as much as any thing else, has contributed to its wonderful railway development. The other prominent factors are the energy of its people and its great resources.

Its railway system is more complete than that of any other South American country, for all parts of the country are in communication with each other, and as far as international lines are concerned this development is complete.

Radiating from Buenos Ayres the railroads traverse the country north, south, east, and west. They touch the eastern coast at La Plata, Mar del Plata, and Bahia Blanca. The western boundary is already crossed to unite with the Chilian railway from Valparaiso, and projects have been formed to unite at other points with the Chilian railways from Copiapo and La Conception. In the north the Bolivian frontier will soon be reached from Jujuy. At Corrientes and Posadas connection will be made with lines in Paraguay, at Monte Caseros with Brazilian lines, and at Concordia with those of Uruguay.

A very noticeable fact is that English and French capital, and more especially the former, has produced this wonderful development. This may be truthfully said of all South American countries, except Peru and Colombia. Not because there is a prejudice against North Americans, but probably on account of the indifference exhibited by capitalists to the great field which is open to them; and perhaps this should not be called indifference, for capital so far has always found an outlet in our own country.

As an evidence of this, I append a copy of a letter published in the Railway Age of February 22, 1890:

ARGENTINE REPUBLIC, SOUTH AMERICA,
National Hotel, Buenos Ayres, January, 1890.

[Correspondence of The Railway Age.]

In my last letter to you I remarked that I would like to see a railroad built and operated in this country by North Americans; that I could see no reason why the capitalists of North America should not invest their funds in this country, as the English are now doing, as their chances are just as good—even better. Here is a country whose soil and climate are unsurpassed; a country rapidly filling up by immigration. The statistics show for the year an immigration increase in the population of 287,000—almost 1,000 people per day landing on these shores, and there is work

for all. For this I can vouch, for to-day it is really a difficult matter to procure laborers for public works. The Government guaranties most of the lines, and all material for railroad purposes is imported free of duty. What a chance for North Americans, who do most of their construction nowadays with machinery. Even the English are beginning to use it here. I know of one contracting firm, away up in the province of Salta, who are working fourteen steam shovels (of English make). Salta is the province in the extreme northwest of the Republic, and the last place in the world where you would expect to see such heavy machinery. The English contractors are beginning to send orders to the States for tools and machinery that are new to them as well as to the country.

A company is organized in England; a concession is applied for in this country; if granted, the capital, engineers, contractors, and tools are sent from England and the work commenced. Why don't we hear of North Americans doing likewise? After the road is built the factories of England get the orders for the rolling stock. True, there is some North American rolling stock here, but there ought to be more. To a North American down here it looks very much as if his countrymen were asleep. John Bull is alive to his interests, and while he sends some of his sons to the States to buy up its breweries he is sending others to build railways in this country. I like the American's pride in himself, but I can't help thinking that the English have more enterprise than we. Go where you will you'll find English. I append here a clipping from the Buenos Ayres Standard of January 1, 1890, giving a review of Argentine railways during the year 1889.*

H. Z. TILLOTSON.

RAILWAYS.

The following is a list of the railways corrected to January 1, 1890, by the use of the above-mentioned extract:

Andine Railroad, from Villa Maria to San Juan via Villa Mercedes and Mendoza, 480 miles. Construction was begun in 1870, and sections opened at various times as they were completed; the Rio Cuarto section in 1873 (82 miles), 76 miles in 1875, 59 miles in 1880, 75 miles in 1883, 80 miles in 1884, and 108 miles to San Juan in 1885. This road was built by the Federal Government at a total cost of about $15,000,000. It is the intention to form a connection through the Uspallata Pass with the Chilian line from Valparaiso. The work is now being pushed with vigor, and it is believed that but little remains to be done. The gauge is 5 feet 6 inches.

A company under the name of the Buenos Ayres and Valparaiso Transandrine Railway Company has been formed to build this extension from Mendoza to the Chilian line, a distance of 121 miles, and the line as above stated is now under construction. This company has a Government guaranty of 7 per cent. on its capital for twenty years.

Argentine Northeastern Railroad.—Line projected from Monte Caseros to Corrientes, 229 miles, and from Monte Caseros to Posadas, 283.7 miles. The concession calls for the completion of the road in five years. Work was pushed during 1889 with remarkable activity. Up to November 30, one hundred and seventy bridges had been built and thirty were in course of construction; 89 miles of rails had been laid and several stations finished.

Bahia Blanca and Northwestern.—A concession has been obtained to build a road from Bahia Blanca to Villa Mercedes via Rio Cuarto, 738 miles. Work was begun on the 18th of September, 1889.

Bahia Nueva Railway, Chubut.—The line was inaugurated on May 25.

Belgrano and Tigre Railway.—The plans were approved in May and the work begun.

Buenos Ayres and Ensenada Port.—From Buenos Ayres to Ensenada, 35 miles. Built by a British company, and opened January 1, 1873; its total cost was about $3,950,000, and its earnings are $10,000 a mile.

Buenos Ayres Northern Railway.—From Buenos Ayres to San Fernando, 20 miles. This company has a subsidy from the provincial government of Buenos Ayres. The total cost was about $2,500,000, and its net earnings in 1887 about $300,000.

Buenos Ayres Great Southern Railway, from Buenos Ayres to Bahia Blanca, 445.25 miles; Altamarino to Tres Arroyos, 300.25 miles; Maipu to Mar del Plata, 80 miles;

* Omitted—G. A. Z.

total, 825.5 miles. Second track 13.5 miles. There are also new lines under construction—San Vicente to Las Flores, about 85 miles; Las Flores to Tandil, about 89 miles; Tres Arroyos to Bahia Blanca, about 112 miles; Piqué to Trenque Lanquen, 132 miles; Arbolito to Necoches, about 93; in all 511 miles. The first section of this road was opened August, 1864.

Buenos Ayres and Bahia Blanca.—Plans for this line must be submitted to the Government before May, 1891.

Buenos Ayres and Pacific Railway, from Mercedes province of Buenos Ayres, to Villa Mercedes, province of San Luis, 371.4 miles from Mercedes to Buenos Ayres, 54.6 miles, or in all 426 miles. The construction of this line was begun in May, 1883, and opened from Orillanos to Villa Mercedes March, 1886, and from Mercedes to Buenos Ayres in March, 1888. This line forms the most important link in the transandine line, connecting at Villa Mercedes with the Andine Railway and at Mercedes with the Western of Buenos Ayres. This company has a gauranty of 7 per cent. upon a capital of about $20,000 a mile.

Buenos Ayres and Rosario Railway (Temple concession).—The surveys were begun and will soon be completed.

Buenos Ayres and Rosario Railway.—Buenos Ayres to Sunchales, 341 miles. An extension is under construction from Sunchales to Tucuman, about 385 miles, and rails have been laid for a distance of about 77.5 miles; part of the line was opened in September, 1889. In the second section of the line to Santiago del Estero the earthworks were pushed forward with great activity. Branches have been authorized from Galvez to Monteros and from Irogoyen to Santa Fé, a total of about 110 miles. A branch from San Lorenzo station to the river bank was opened in August, 1889.

Campana Railway, Pila, surveys have been completed and plans will be presented to the Government immediately.

Central Argentine Railway, Rosario to Cordoba, 246.6 miles, with branches to Las Yerbas and to Porgamino in course of construction, 167.5 miles. The company opened to traffic in July the first section from Canada de Gomez to Las Rosas, and the second section from Las Rosas to El Treval is also ready for service. The other section from Canada de Gomez will be ready for public service in January. The main line was opened in 1870, its total cost being about $9,000,000.

The concession for a road from Rosario to Pezzano has recently been transferred to this company, the plans having previously been approved by the Government.

Chilecito and Mejicano Railway.—The plans were approved in June.

Cordoba and Northwestern.—Road authorized from Cordoba to Crus del Eje, 100 miles. It has a subsidy of $35,500 per mile. The property is to be exempt from taxation, and at the end of fifty years after the completion of the work it is to revert to the Government.

Cordoba Southern Railway, Santa Fé.—The new plans and the contract for construction have been approved by the Government.

Cordoba Central Railway.—Company was registered in August, 1887, to acquire a concession granted by the provincial government of Cordoba. The line is projected from city of Cordoba to a junction with the Western and Central Colonies Railway of Santa Fé, 132 miles.

East Argentine Railway.—Concordia to Monte Caseros, 96 miles, Monte Caseros to Ceibo Creek, 3 miles. This line follows the west bank of the Uruguay River, and was opened to Ceibo Creek in 1880. The concession was granted in 1869. From Ceibo Creek this company runs steamers to Uruguayana, Brazil.

Entre Rios Central Railway, from Parana to Uruguay, 186 miles, traversing the entire province. The first section of the line to Nogoya, 77.5 miles, was to be opened in 1886 and the remainder the following year.

First Entre-riano Railroad, Gualeguaychu to Puerto Echague, 6.2 miles. Owned by the province of Entre Rios, and built in 1878, at a cost of $153,839.

Gran Chaco Austral Railway.—Although the plans were approved in 1888, the work has not yet been begun.

Goya and Lucero Railway.—The plans were approved and the kilometric cost was set down at $28,000 in gold. This is equal to about $45,162 per mile. The work of construction has not begun.

Interoceanic Railway.—The contract was approved in February, Mr. Bustamente being the concessionaire.

Lugan Railway (Melincue).—Plans for the entire length of the line are before the railroad bureau.

Mendoza and San Rafael Railway.—Projected from Mendoza to San Rafael, 180 miles south of Mendoza. Surveys are in progress and the road is to be built by the National Government.

National Central Northern Railway.—Main line, Cordoba to Tucuman, 338.5 miles. Branch from Frias to Santiago del Estero, 100.4 miles, and from Recreo to Chumbricha, 109.1 miles. Gauge, 1 meter. This line, built and owned by the National Government, was begun in 1872 under the direction of José Telfener, and in 1885 both lines were opened. The total cost was about $22,000 per mile. It crosses 300 miles of country in which there is no water. Each freight train carries three water-tank cars, each containing 8 tons of water. The line is now open to Salta and Jujuy and will ultimately be extended to the Bolivian frontier.

Northern Colonies Railway of Sante Fé.—From Santa Fé to Lehman, in same province, 62 miles, opened in July, 1885. Branch from San Carlos to Santa Fé, opened in 1886, and from Santa Fé to Port of Colastine in October, 1886. An extension from Lehman to the southern boundary line of the lands of the Santa Fé Land Company, 100.75 miles, is under construction. This line was built and is owned by the provincial government of Santa Fé.

Nanducito and Presidencia Roca Railway.—The final plans were completed and cost per mile, $46,194, approved.

Northwest Argentine Railway.—Line projected from La Madrid, on the Central Northern Railway, to Tucuman. The first section to Santa Ana, 30 miles, was opened in July, 1888, and the whole line was to be completed in the summer of 1889. There is no monetary guaranty with the concession.

Patagones Railway (Villa Maria).—The surveys were to have been presented to the Government in November.

Posadas Railway (Ituzaingo).—The concessionares are to present plans before the end of 1890.

Resistencia and Oran Railway.—Very little progress was made in the plans, and the Government has allowed another year for the presentation.

Reconquista Railway (Villa Maria).—Plans are to be presented before the end of April.

San Antonio-Areco Railway (Rivadavia).—The contract for the building was signed in January; the original plans were amended and approved in November.

San Cristobal and Tucuman Railway.—The plans were approved and work begun in October, rails having been laid as far as kilometer 17.

Santa Fé and Cordoba Great Southern Railway.—A concession was granted by the National Government for a line of railway from Villa Constitucion, via Melincue, to Venado Tuerto, a distance of 103 miles, and from Villa Constitucion to La Carlota, 84 miles; a total distance of 187 miles. The concession exempts the property from taxation and calls for the completion of line by January 22, 1891. The section from Villa Constitucion to Melincue was expected to be opened about January, 1890.

San Fernando Railway (Pergamino).—All the plans have been approved and authority has been given to build a double track.

San Juan to Chumbicha Railway.—The plans were approved in October.

San Juan to Salta.—The plans for the first 60 miles were examined and approved.

San Rafael to 9 de Julio.—Plans were approved in July.

Santa Rosa Railway (Conception del Tio).—The plans and surveys of this line, 105.4 miles long, were approved on the 7th of November last.

Santa Rosa and Oran Railway.—The surveys were begun and the guaranty reduced to 5 per cent., on a kilometer cost of $37,000 in gold ($58,678 per mile).

Tinogasta and Andalgala Railway.—All the plans were approved. The line enjoys a guaranty for twenty years.

Villa Mercedes and Rioja Railway.—The contract was approved in February. The total cost of the line was set down at $13,837,500 gold; the length of the line being 381.3 miles.

Villa Maria and Rufino Railway.—Projected from Villa Maria, on the Central Argentine Railway, to Rufino, on the Buenos Ayres and Pacific, a distance, via Villa Nueva and Carlota, of about 140.5 miles. The concession was obtained from the National Government. The works were begun in July, the line being divided into two sections, viz: From Villa Maria to kilometer 109, and from there to Rufino. On the 30th of September the earthworks had reached kilometer 30 and the rails kilometer 8.

Western and Central Colonies of Santa Fé.—Lines in progress, San Carlos (N. C. Ext. Co.) to Galoez (B. A. and R. Ry.), 217 miles; Gessler Colony to Corondo, 18.6 miles; Pilas (N. C. Ry.) southwest to boundary of Cordoba, 52.7 miles; Humboldt (N. C. Ry.) northerly 49.6 miles. The lines are being built by the provincial government of Santa Fé, and it was expected that they would be opened during the latter part of 1889.

Western Railway of Buenos Ayres, from Buenos Ayres to 9 de Julio, 162.4 miles; Lugan via Pergamino to Junin, 155.6 miles; Merlo to Lobos and Saladillo, 93.6 miles; La Plata via Temperley to Moron, 47.1 miles; La Plata to Ferrari, 24.2 miles; Pergamino to San Nicholas, 45.9 miles; Temperley to Canuelas, 29.1 miles, and several small branches aggregating 19.8 miles, or 574.7 miles in all. There are projected: 9 de Julio to Los Mellizos, Saladillo to Alvear, second track 28.5 miles, and other track 74.4 miles—a grand total of 677.66 miles. The construction of the road was begun in 1853 by the provincial government of Buenos Ayres. Gauge, 5 feet 5 inches.

Western Railway of Santa Fé.—Projected to run from Rosario to San José de la Esquina, 110 miles, and from Candelaria to Melincue, 80 miles. It is completed from Rosario to Candelaria, 40 miles.

The engineer department of the Government drew up plans for the following: Santa Rosa via Majotoro to Salta, Salta to Cabra Corrol, San Juan to Jachal, Chumbicha to Tinogasta and Andalgala.

All that relates to the Argentine railways is under the supervision of the department of civil engineers, an important and ably managed national bureau which employs ninty-eight civil engineers.

There continues to be a great movement throughout the Argentine Republic in the construction of railways. So great are the number of new concessions granted by the national congress and by the different provincial legislatures that I find it impossible to name them all. Up to the meeting of the last congress there were national concessions for seventeen different lines, of which thirteen enjoy the guaranty of the Government. These guarantied lines represent a total length of 7,961 kilometers (4,975 miles), and the aggregate length of the other lines, 1,272 kilometers (795 miles), making a total of 5,770 miles. Among them are the following, viz: The Chaco and Tartagal Railway, the Reconquista and Formosa (Chaco) Railway, the Bahia Blanca and Villa Mercedes Railway, the San Juan and Salta Railway, the Chumbicha, Tinogasta and Andalgala Railway, the Goya and Monte Caseros Railway, the Resistencia and Metan Railway, the San Cristobal and Tucuman Railway, etc. A line from San Juan to Cabra Corral, in Salta, is being surveyed, as also one from Mendoza to San Rafael; also the line from Cobos to Salta via Lagunilla, and several others of less prominence.

The following roads are in the course of construction, to wit: The extensions of the Northern Central, the road now being opened beyond Tucuman as far as Chilcas. The branches from Dean Furnes to Chilecito, and from Chumbicha to Catamarca have the road-beds completed and the track laying has commenced. Beyond Chilcas

towards Salto and Jujuy the work is still progressing, but there are many engineering difficulties to overcome, and not much has as yet been accomplished. The line from Buenos Ayres to Mercedes, which is a link of the Transandine Railway, is now completed and opened to traffic, thus giving a through line from Buenos Ayres as far as Mendoza. Work continues to progress on the link from Mendoza towards Valparaiso, Chili, some of the track having already been laid, and by the end of the year it is expected that the Uspallata Pass of the Andes will be reached. For the construction of the railway from Monte Caseros to Corrientes and Posadas in the Misiones the necessary materials are now being received, and the work has commenced. The new line from Rosario, via Sunchales, to Tucuman is being rapidly pushed forward, and the rails are laid for 50 or 60 miles beyond Sunchales.

The last session of the Argentine congress, in response to the recommendations of the president, made a very firm stand against the granting of any more charters or concessions with Government guaranties, and the fact that numerous applications were made for new lines without such guaranties shows that the condition of the country is now so promising that capital is ready to embark in such enterprises without Government aid. (Report by Consul Baker, Buenos Ayres, December 13, 1888.)

From the report of the South American commissioner I extract the following, dated June, 1885.

The effect of railroad building, which during the last few years has been very marked, seems to stimulate the raising of grain and the growth of flocks more than any other agricultural pursuit. The completed railroads embrace over 2,800 miles, and the extension of those lines now under construction amount to nearly 900 miles. There are projected, also, many thousand miles more, which in the course of time will be built. A railroad man (an American) describes this country in this respect as being in the condition of our country thirty years ago. The cost of building roads throughout Argentine is very little, so far as grading is concerned. Many of the lines had but little to do for long tangents except to lay down the rails on the even plains. At first some trouble was found on certain lines to provide stone for culverts and abutments, but afterwards plenty of good building rock was discovered. The cost of procuring ties is heavy, as they must be brought from the northern provinces or from Paraguay. Now a line of road is being constructed toward and through the Gran Chaco and the fine forest lands of the Republic. This extension is also designed to reach into Bolivia and its greatest timber tracts, thereby giving to that Republic an eastern outlet for its rich mines and agricultural products. The completion of this road will cheapen the cost of lumber to all the Republics, and open up an industry of great profit in the luxuriant forests of the Upper Parana and other streams. At present the largest cost to the estancia holders in fencing grows out of the scarcity of posts. The policy of inclosing all the pasture land of the owner is becoming universal, and the erection of corrals increases the expenses of a good estancia very materially, for they are made almost entirely of lumber imported from our country.

At present there is no coal found in this country, and the engines are all driven by fuel brought from Cardiff. This is a serious drawback to the railroads of the Republic. Those lines running toward the north can in time obtain wood from that region. But it will probably always be cheaper to import coal for the most of the roads than to rely upon the northern forests. There has been a recent discovery of petroleum in the western part of the Republic, in the province of Mendoza, and a company has been organized to develop the oil-producing districts, and many believe that near by will be found coal measures of considerable extent.

The railroads are in part owned and managed by the Government. If we trust the statement of Mr. Hopkins, herewith submitted, we find the result of this management to be here, as in Chili, very unsatisfactory; and great complaints are made at the high railroad charges of all the companies. But the cost of operating must be very serious, and no people ever think they are charged too little for railroad transportation; but all agree that new regions are being made accessible and great agricultural industries are being promoted by these modes of internal communication, though they are expensive.

The railroad map of the Republic shows how little of its territory has yet felt the beneficial effects of these arteries of commerce. Ten times its present railroad development would fail to bring the whole country into anything like close communication. But the fever of railroad building has touched the people, and in some way these needed lines will be pushed to completion. One gentleman observed that in many respects it was cheaper to build railroads than highways, of which there are very few, called cart roads, in the country. As yet the private railroads have been built almost wholly by English and French capital, but they were aided by liberal concessions from the Government lands, and a guaranty of a certain interest on the construction bonds, and these guaranties have not been called into force in but one instance, so remunerative have the investments proven.

THE FUTURE OF ARGENTINE.

From the interesting paper on the railroads of the Republic, by Mr. Russel R. Pealer, the lines and present roads and those in construction can be learned. The advantages of the country for American capital are pointed out, and probably a hint may be found in the projected Bolivian line of the future railroad which shall connect North and South America. We have met with no one familiar with the entire line, but at Montevideo we listened to a professor in a college there, who professed to have been over the route from the Isthmus south to Buenos Ayers. If he is correct, there are no insurmountable obstacles in the way of this colossal undertaking. The president of this Republic said on this point that his people would push their line up into Bolivia, and he hoped it would come in his day that one might take a car at Buenos Ayres and not change until he set foot in New York. Mr. Pealer's paper is replete with suggestions and worthy of the attention of our people. The drawback to an extensive system lies in the vast size of the estancias and, in consequence, the sparse population. The towns are far apart and so long as cattle and sheep are the chief industries the freight traffic can not be at all equal to what it would be with grain farming, and in neither case can it be what it would be were the land cut into small farms. The policy of selling the land by leagues—6,600 acres in a body—still prevails.

In a few days there will be opened to purchase by these large areas a wide tract of country lately taken from the Indians. To counteract this aggregation of lands in one ownership, the law of inheritance requires all estates to be divided among the children of the decedent and his widow in certain proportions; and it renders it impossible to defeat this end by any will or devise. But it is quite clear that, aside from this provision of the statute, the land must, in time, suffer division in all those regions where grain-raising shall be deemed more profitable than stock pursuits. This will result from the tendency among European laborers, on whom the country mainly relies, to become land-owners. They can afford to pay so much more for their small farms than the landlord can realize in any other way, so that he will find it to his interest to subdivide his estate. This tendency finds encouragement in the fact that the larger proportion of estancia-holders now reside in Buenos Ayres and other large towns, and have no attachment to the estates. Their city expenses and mode of life draw heavily on their country incomes. Habits of idleness fall upon their sons, few of whom take any lively interest in their fathers' estancias. The immigrant from Italy, the Basque provinces, or Germany, loves to till his own acres. The work the Basques accomplish, when on their own land, is continuous and very great. The Italian does not fall far behind. With the division of these estates will of course come a greater demand for railroads. The products from the sea-port markets will multiply. Already quite a supply of linseed comes to our country from the Argentine Republic, and we may look to a very diversified agriculture on these plains. While they are now treeless, yet they have been found to be well adapted to rearing forest growths, as well as many kinds of fruits, apples, pears, peaches, apricots, and most of our northern fruits are already abundant, while the northern regions furnish tropical productions in unlimited amounts; and this brings us to consider briefly the colossal development of the Republic and the people it is drawing hither.

RAILWAY SYSTEM OF THE ARGENTINE REPUBLIC.

[Statement of RUSSELL B. PEALER, of Buenos Ayres.]

In reply to your question as to what plans I have for the extension of the railroad system of this country into Paraguay and Bolivia to facilitate and increase our commercial relations, I shall as briefly as possible give you our opinion on the subject.

At present we are engaged on the construction of a railway line in the province of Entre Rios from "Puerto Echague," the head of ocean navigation on the Uruguay River to Concordia, the length of the line being 156 miles. From Concordia I propose extending our line through the provinces of Entre Rios and Corrientes into Misiones, to Posadas, the capital of that territory. From that point our intention is to extend the road into Paraguay, passing by Villa Rica and traversing the country between Asuncion and the limits of the southern boundary of Brazil, penetrating into Bolivia and continuing around toward the northern boundary of Peru and along into Ecuador, intercepting the Grand Intercontinental Railway, and forming the link that will connect it with the head of ocean navigation of the River Plate at Puerto Echague, on the Uruguay River.

The concession we have asked for and expect to obtain from the Paraguayan and Bolivian Governments: First, perpetuity; second, Government guaranty of 6 per cent. on the cost of $40,000 per mile; the Government to grant us from 6 to 12 square leagues of land along the line.

As soon as the road is in operation these lands must naturally increase rapidly in value, and, though perhaps not worth more than $1 per acre in the beginning, must advance to more than $20 per acre in less than twenty years. This has been the history of all lands along the line of railways constructed in this country, and the same may be expected of them in Paraguay and Bolivia when railway facilities attract immigration and increase the industries.

At present the Government may not afford to pay more than half the guaranty, but as they develop by means of the enterprise and become enriched by the immense increase in value of their lands, they will soon be enabled to pay the 6 per cent. guaranty. The cost of these roads, with single track, will not exceed $30,000 per mile, as we know of no engineering difficulties up to the northern boundary of Bolivia; nor would there be any should we go through the Amazon portion of Brazil. The principal streams will be crossed at their heads, where they are small, and branches from the trunk line be made to lead to the head of steam-boat navigation of the Orinoco, Amazon, and other important rivers to the Atlantic, then to connect with the steamers to and from the United States.

The western and southwestern portions of Brazil would be an important element to the railway and our river and ocean steamers. Besides a line of steamers to the River Plate, we would recommend a line to the Orinoco, and another to the Amazon to run in connection with the steamers on those rivers to our railway system.

When all this is done our people will hold and control the key of the trade with all this portion of South America, and solve the question of rapid communication and quick transit of commerce with these countries. If by sea our steamers can afford to carry merchandise as cheaply as do those of the Lamport and Holt line, they will undoubtedly get the most of it. Those of us here doing business with the United States find ourselves heavily handicapped by those in the European trade.

Merchandise from the United States takes double the time to reach here that goods do ordered from any part of Europe; and in view of the small proportion of vessels obtaining return cargoes, freights are much higher from the United States than from Europe by steamers, which, in addition to their freight, derive much of their profit from the carrying of passengers and emigrants.

The benefits to be derived from the direct communication with the United States as afforded by our trunk line of railway in connection with the grand intercontinental railway system projected by the United States people to connect North, Central, and South American countries, can not be overestimated, and must, in our opinion, have a most favorable influence upon the governments and the people of the republics.

The Argentine Republic already possesses the advantages of a direct trade with the United States and Europe to such an extent that her commerce is carried on as conveniently and advantageously as that of any other country; but it would be greatly increased by the construction of this great railroad enterprise, bringing down to the head of ocean navigation the products of the upper regions of the undeveloped countries, and affording a quick and economical means of conveying to them the imports brought to supply these countries.

In the mean time, to obtain some of the benefits referred to, we must have direct and prompt communication with the United States by means of steamers terminating their route at Buenos Ayres. Owing to the geographical position the Argentine Republic posseses every facility for carrying on its commerce. Paraguay, owing to its great distance from the sea-board, and Bolivia, from its distance inland and isolated position, may be considered as comparatively excluded from intercourse with the rest of the world at present.

All the wants of both these countries could be supplied from the United States, and the cost of bringing those supplies by means heretofore described. Paraguay pays one freight to the River Plate and twice as much more in addition from the River Plate to Asuncion. Bolivia, owing to its inland situation must now deprive itself of many things that it would consume, or have to submit to the heavy tax now paid for transportation over difficult overland mountainous country on the backs of mules. Railway communication would so far reduce the cost of carriage as to enable the populations of Bolivia and Paraguay to consume liberally many things manufactured in the United States of which they now have to do without.

We do not consider that the extension of the line of railways to Mendoza and Tucuman, also Jujuy, can have any effect upon diverting trade away from Bolivia and Peru to the Atlantic sea-board, because of the great extent of the mountainous country to be traversed between them, and because of the diversity of gauges of those roads and ours which would forbid the forming of a connection.

One gauge is 5 feet 6 inches and the other is 1 meter, while our projected line is the American standard gauge of 4 feet 8½ inches throughout.

In addition to the many articles of export from Paraguay and Bolivia, of which I shall make mention hereafter, I would now refer to the products of cattle as an important factor in the trade between the United States and those countries. In some

parts cattle are very abundant, and for want of an outlet have increased to such an extent that they can be bought for $3 per head.

The opening of communication with Paraguay and Bolivia would enable them to find a market for the hides in the United States and the dried beef in Brazil, to the mutual benefit of the producers and the railways.

Herewith I beg to hand you a skeleton map of the Argentine Republic, showing the railways built and in operation, those now under construction, and those projected, the names of the companies, and which are owned by the national or provincial governments. This will give you a brief idea of the entire railway system of the Argentine Republic.

In addition to the map, I give you a list of all the railways in operation in the Republic, their gauge, ownership, and length; also, of those under construction.

The total number of miles of telegraph in operation is 18,000, all owned by the national government, and 2,000 miles more under construction. The only private line—owned by an English company—is that between this city and Montevideo, connected by a cable across the La Plata River, between Buenos Ayres and Colonia.

There is but one railroad in Paraguay, that being only 40 miles in length, and was built many years ago by the Dictator Lopez.

In the Republic of Bolivia there does not exist a single mile of railway.

All the railroads in the Argentine Republic are now paying from 7 to 14 per cent. (see quotations on railway stock of Argentine Republic, varying from 25 to 75 per cent. premium). All the roads when properly built and equipped, 50 per cent. of the gross earnings are more than sufficient for the working expenses, as the quality of the land for the road-beds is generally good, and no frost to contend with.

These railroads, built and owned by foreign companies, have had the benefit of a 6 per cent. Government guaranty, varying from £6,000 to £10,000 per mile. Of late years they have nearly thrown off the guaranty and paid back the Government such guaranty as was received during the early existence of the roads.

Most of the railway concessions are granted for perpetuity, and all material for building and equipping are allowed to be imported into the country free of duties, and are free of all internal taxes. All works that are considered public come under the same category.

These English companies have all amassed immense fortunes out of these railway enterprises and Government guaranties. We would here state that railway enterprises and other public works are still in their infancy, and I can only compare this country now to what the United States was some thirty years ago. Now is the time for the American people to get a foothold here, and, with their capital, control and monopolize the future public works of this great valley.

The people here will give preference to the Americans over any other nationality, and we can attain from them grants and concessions when no other people can. Formerly Americans have not been able to compete with other nationalities owing to the cheapness of money and material, but that day is now gone by and America can compete with both money and material against any European country. British capital and influence to control these countries is a thing of the past. They are not now, nor ever have been, congenial to the Latin races, and especially to the people of these republics. The greatest enemies and competitors the Americans have out here to contend with are the English.

This country has always faithfully paid up its obligations on all the public works as well as its national debt, and its credit stands to-day almost equal to that of the United States. Its progress is fast following that of our own.

These republics, when traversed with railways into their interior, will open out the great mineral wealth of the Cordillera slope.

Formerly this great valley was one vast grazing ground, principally for cattle, horses, sheep, and goats, etc. Animals live without shelter the year round, and it is not required to store food for the winter months, as done in the United States. Labor is cheap, owing to the abundance of meat, fish, game, fruit, and vegetables.

Owing to the immense European immigration these countries are fast developing into an agricultural region. It is one of the healthiest climates on the face of the earth; our average temperature in winter is 54 degrees, in summer 74 degrees, and seldom ever rises to 90 degrees.

List of railways in the Argentine Republic.

	Miles.
Central Argentine: Rosarios to Cordova, gauge 5 feet 6 inches (English company)	248
Northern Central, gauge 3 feet 3½ inches (owned by National Government):	
Cordova to Tucuman	340
Tucuman to Metun (Saltu)	180
Frias to Santiago del Estero	100
Andine Railway, gauge 5 feet 6 inches (owned by National Government):	
Villa Maria to Mendoza	380
Mendoza to San Juan	100
East Argentine, gauge 4 feet 8½ inches (English company): Concordia to Monte Caseros	100
Campana Railway, gauge 5 feet 6 inches (English company): Buenos Ayres to Campana	40
Northern Railway, gauge 5 feet 6 inches (English company): Buenos Ayres to Tigre	18
Ensenada Railway, gauge 5 feet 6 inches (English company): Buenos Ayres to Ensenada	35
Southern Railway, gauge 5 feet 6 inches (English Company): Buenos Ayres to Bathia Blanca	636
Santa Fé Railway, gauge 3 feet 3½ inches (English company): Santa Fé to the Colonies	56
Western Railway, gauge 5 feet 6 inches (owned by the Government of Province of Buenos Ayres): Buenos Ayres to San Nicholas and branch to La Plata.	610
	2,843

List of railways under construction.

	Miles.
Campana and Rosario, gauge 5 feet 6 inches (English company): Campana to Rosario	140
Entre Rios Eastern, gauge 4 feet 8½ inches (American company): Port Echague to Concordia	156
Transandine Railway, gauge 5 feet 6 inches (English company): Mercedes, Buenos Ayres to Villa Mercedes, San Luis	350
Entre Riano Railway, gauge 4 feet 8½ inches (owned by the Government of Province of Entre Rios): Parana to Concepcion	182
Central Northern Railway, Metan to Jujuy	62
	890

RECAPITULATION.

Ten railways in operation	2,843
Five railways under construction	890
	3,733

URUGUAY.

The railways of Uruguay radiate from Montevideo and connect on the west and north with those of Argentine, Paraguay, and Brazil. There are now 400 miles constructed and much more projected, principally toward the Brazilian frontier.

A general railroad law was enacted in 1884, which named certain lines recommended by a commission of engineers as worthy of construction, and which named also the conditions which were to govern the granting of concessions and the construction of the lines. The gauge was to be 4 feet 8½ inches, and the minimum radius of curvature 400 meters. A guaranty of 7 per cent. per annum on about $25,000 per mile was to accompany the concessions.

The lines named are shown upon the map accompanying the report of the delegate from Uruguay, but I believe some of them are not yet under construction.

Central Uruguay Railway Company of Montevideo.—Line of road authorized, Montevideo to Durazno; completed from Montevideo to Rio Negro, 170 miles. Branch: Santa Lucia to San José, 20 miles, total 190 miles. Opened from Montevideo to Santa

Lucia, 40 miles, in 1872, and to the present terminus in 1879. Extension to north bank of Rio Negro, 41 miles, opened July, 1885. The Government has granted a perpetual succession, with a guaranty of $3,500 per mile attaching, as each separate section is opened. This company operates the line of the Uruguay Central and Hygueritas Railway Company, extending from the junction with the Central Uruguay at Juan Chaso to San José, 20 miles. The total authorized length of the latter line is 146 miles, Santa Lucia to Hygueritas, the Government also guarantying a net revenue of 7 per cent. on £10,000 pounds per mile (about $50,000).

Central Uruguay Northern Extension Company, registered in London, October, 27, 1888, to acquire a concession from the Uruguayan Government for a line forming an extension of the system of the Central Uruguay Railway Company, of Montevideo, to the Brazilian frontier, a distance of about 288 kilometers (179 miles).

Northeastern Railway.—Projected from Montevideo to Artigas (on the Brazilian frontier); completed to Minas, 74 miles. The section to Pando, 18 miles, was completed in 1883.

Northwestern Railway.—From Salto to Santa Rosa and the Brazilian frontier, 111 miles, with a branch from Isla de Cabello to San Eugenio, 70 miles. Main line is completed and connects at its northern terminus with the Brazilian Great Southern Railroad from Uruguayana. The Uruguay road runs parallel to that from Concordia to Ceiba in Argentine.

Midland Uruguay Railway Company.—Projected line of road from Paso de los Toros to Salto, 174 miles. Registered in London under the Companies act, July 2, 1887, to acquire a concession granted by the Government of Uruguay. Under this concession the Government guaranties, for a period of forty years, commencing from the opening of each section of 50 kilometers, 7 per cent. per annum on a capital stock of £5,000 per kilometer.

Northern Railway and Tramway Company.—Montevideo to Santa Lucia, has 25 miles in operation.

PARAGUAY.

The railway from Asuncion to Paraguari, a distance of 45.2 miles (72 kilometers 417 meters), the first line constructed in South America, was built for Lopez during the year, 1861–'64 by the Englishmen Burrell, Valpy, and Thompson, with a force of 6,000 soldiers detailed for the purpose. It rested at Paraguari until recently, the war having stopped it midway on its course to Villa Rica, the proposed terminus. After many vicissitudes the building of the road has been resumed, and the new station, General Escobar, 11.20 miles (18 kilometers, 50 meters) beyond Paraguari, was opened last September. Work on the road-bed is being pushed, and a fine bridge across Tebicuari of 260 meters is in process of construction. It is expected that it will be completed to Villa Rica during the coming year, a distance from Asuncion of 91.48 miles (147 kilometers, 242 meters). A concession to further extend the railway to Encarnacion, on the Parana River, has been granted to certain parties, who are now in London negotiating its sale.

Trains run daily from Asuncion to Escobar and return, leaving the former at 6 o'clock a. m., arriving at Escobar at 12; leaving Escobar (returning) at 1 p. m., and arriving at Asuncion at 6 p. m. The old track to Paraguari has recently been thoroughly overhauled. New bridges and culverts have been built. There are four classes of cars. The first-class coaches, of Belgian make, are beautiful carriages, as fine in appearance as the best American coaches, and perhaps more ornate in their appointments. The second and third class coaches are plain, comfortable carriages. The fourth class are simple trucks without seats, but are very cheap and certainly a great convenience to the poor Paraguayans, mainly women, who patronize it. First-class fare, about 4½ cents.

The railway traverses a very picturesque region. The orange and palm groves of Luque, the superb lake of Ipacarai, stretching out to the foot of the Cordillera; the peak of Itagua, the valley of the Pirayu, the Cerro Batovi, and the bold heights about Paraguari form a pleasing landscape of considerable variety. The section now being extended to Villa Rica will pass over a still more charming country.

The number of passengers carried last year amounted to 257,688; amount of traffic, $161,550. In 1881 the total number of passengers amounted to 81,807; total amount of traffic, $62.20[illegible] The passengers and traffic returns for 1887 show a considerable

increase over those of 1886, in which year 120,865 persons were carried, and the traffic reached the sum of $85,606.17.

In 1876 a survey was made for a railway, which was to start from a town called Curitaba, in the Brazilian province of Parana, near Paranagua, and run thence to Matto Grosso and Bolivia, thus placing Paraguay within five days of Rio de Janeiro.

The air of the River Plate is full of great railway enterprises just now, and new lines and gigantic combinations are projected in every direction. A late number of the Buenos Ayres Standard contains the following:

"Messrs. Clark & Co. have long planned a vast net-work of railway in the South American Continent, and the scheme for a line from Recife to the Pacific coast forms part of this bold plan. Such a line would eclipse the Panama Canal and rouse the wonder of the world. Rapid communication would be established between Australia and Europe, and immigration to the Pacific coast would be considerably facilitated. The lines which the Messrs. Clark are at present building from Monte Caseros to Corrientes, Posadas, and Missiones also form part of the vast plan alluded to and are intended to connect us with the transcontinental Brazilian line. The plans were roughly drawn up in 1886 by these fore-seeing and powerful railway kings. The first section, according to the plan, stretches from the Missiones territory as far as San Pablo, in a southwesterly direction from the lines at present in course of construction. At Curitiba a branch line would be built to Paranagua, on the Atlantic, and at San Pablo there would be a junction with the railway running to Rio Janeiro, or with that terminating in Santos. The second section, which runs in a more westerly direction, would be the prolongation northward of the Missiones line. It would incline gently eastward after crossing the province of Parana and San Pablo,* then continue to the west of Minas Geræs and Bahia, and terminate in Pernambuco.

"The third, an interoceanic section, would form a junction with the Transandine line. It would stretch from Villa Mercedes, in San Luis, through Villa Maria (as at present), Santa Fé, Esperanza, along the right bank of the Parana as far as Corrientes. It would then cross the river a little higher up and stretch to Asuncion, thence to Paraguari, Villa Rica, and other towns, and finally into Brazilian territory to Para, communicating, by means of a branch to Braganza, with the Atlantic. Such is the gigantic scheme which the Messrs. Clark have been planning since 1886. The Emperor Pedro is highly in favor of it and assured Mr. Matthew Clark in London that he would do everything in his power to assist him and his brother to carry out the greatest scheme of the age."

The often discussed project of a great international railway to run from Buenos Ayres, through Paraguay, Bolivia, Peru, and Ecuador to Bogota in Colombia, thence to coast, to Carthagena or Panama, on the Isthmus, has been ably and exhaustibly dealt with by Minister Bacon in a recent issue of the Consular Reports.

The Government in September, 1887, concluded the following agreement for the sale of the present line of railway with a view to its extension to Villa Encarnacion, on the Parana River:

"ARTICLE I. The executive is authorized to make arrangements with Dr. William Stewart for the sale of the railway from Asuncion to Villa Rica and all appurtenances for 2,100,000 hard dollars gold. The purchaser being to prolong the line to Villa Encarnacion.

* * * * * * * * * * *

"ARTICLE V. The executive concedes to Dr. William Stewart the right to build and work a railway from Villa Rica to Villa Encarnacion in accordance with the conditions specified in this law.

* * * * * * * * * * *

"ARTICLE VII. * * * The company is at liberty to build such branches as may be found necessary, without, however, having the privileges of a guaranty.

"ARTICLE VIII. The Government guaranties an annual interest of 6 per cent. on the capital sunk in this undertaking for twenty-years. The maximum cost per kilometer not to exceed 30,000 hard dollars gold. * * * Government to determine tariff so soon as net earnings exceed 12 per cent. per annum."

Dr. Stewart is now in London to effect the sale as projected, but has not succeeded in doing so up to this time. The railway has been reported as sold several times during the year. The matter is one of great moment to those interested in the country, and the fate of the "Stewart concession" has been closely watched. It is now reported that Dr. Stewart has asked the Government for an extension of three months' time; also that the Government does not feel inclined to accede to the request. I understand, further, that in case Dr. Stewart fails to place the concession in London a Belgian company stands ready to succeed in his rights in the matter. There is no doubt that the road will be extended soon by some company. (Report by Frank D. Hill, United States Consul, Asuncion, Paraguay, January 23, 1889.)

* Probably San Paulo.

This English company is pushing the construction of the work, which is to be finished to Encarnacion in 1892. It will connect with the road now being constructed from Monte Caseros to Posados in Argentine and will put Paraguay in rail connection with Montevideo and Buenos Ayres.

The receipts of the 45 miles in operation for 1888 were $210,000, while for 1881 they were only $61,207.

The entire line from Asuncion to Villa Rica was put in operation January, 1890.

Another great project has just been elaborated which will put Paraguay in communication with the eastern coast of South America. This line is to be called The Transcontinental Railway from Asuncion to Santos, and is to run from Asuncion to the northeastern frontier of Paraguay, where at the junction of the Sierra Mbaracayu with the Sierra Amamby, it will enter Brazil about the twenty-fourth parallel, which will be followed to Santos, the great port of San Paulo. Its length will be about 1,300 kilometers (806 miles).

BRAZIL.

This great country exhibits in the most marked degree the statement made in regard to the location of the mass of the population, for less than half the territory contains almost all the inhabitants. Omitting the provinces of Amazonas, Para, Matto Grosso, and Goyaz, comprising the interior, there remain 1,157,842 square miles, out of a total of 3,119,764 square miles, in which live 13,222,860 out of the 14,002,335 people, according to the estimate of 1888.

This fact can easily be explained from the physicial features of the country. The Amazon, whose tributaries spread in all directions, traverses it from west to east, and between these water courses are vast plains covered so thickly with vegetation as to be almost impenetrable. Along the coast there are several ranges of hills with elevated lands between, and here is the mineral and agricultural wealth of the country. The table-land of Matto Grosso divides the waters of the Amazon and the La Plata, the sources of the latter rising within a very short distance of the Atlantic. The San Francisco River flows northeastward between two ranges.

RAILWAYS.

Transportation in the interior is carried on entirely by water, and along the coast by mules and railways, the majority of the latter being in the southeast, and one-fourth of the whole in the province of San Paulo. These railways were first built from the coast towards the interior and their length was limited by the distance of the mountains from the coast. Indeed, this is still true, for there are only two or three exceptions, the greatest being the Don Pedro Segundo Railway in the province of Rio de Janeiro, which runs parallel to the coast and some distance from it, and the Madeira and Mamore Railway, projected along the Madeira River, far in the interior, around the falls which form the only obstruction to navigation from the interior of Bolivia to the Alantic Ocean.

In the south, connection is made with the railways of Argentine and Uruguay, but as the lines in Brazil are not united, traffic to these countries can not be carried on very extensively. Another project has been elaborated for a line from the city of San Paulo westward to Paraguay, and a line is under construction from Porto Alegre westward to Uruguayana. The Paraguay line will give communication between the most populous portions of Brazil and all of Paraguay. The line from Porto Alegre to Bagé might also be extended to the frontier of Uruguay.

A point to be noted is that railway communication northward in the eastern part of the country is almost impossible because of great size of the water-courses, and, consequently, traffic between the southeastern part of Brazil and Venezuela or Colombia will for many years be carried on by water.

In an extract from the Consular Reports of 1882 there is a report by Consular Agent Comsett, in which he refers to international lines of road.*

The principal Brazilian railways are the following:

Alagoas Railway, from Maceio to Imperatrix, 55 miles, along the valley of the Mundahu River in the province of Alagoas. Gauge, 1 meter. This company was organized in 1881 to build the line under the concession granted to Domingos Mortinho and Jacquimda Silva Leao. Road was opened December 3, 1884. The Government guaranties 7 per cent. per annum on maximum capital £512,212, and reserves rights of purchase. In 1885 a concession was obtained from the Provincial Government for the construction of a branch from the main line to the town of Assemblea, about 40 miles, and surveys have recently been completed. A dividend of 5¼ per cent. was paid from the Government guaranty.

Bahia and Minas Railway, from Carvellas to Aymore, 88 miles, and extension, 9.3 miles. This railway is now under construction to Philadelphia, 155.6 miles; gauge, 1 meter. It was built under a concession granted to M. F. Argolla, the construction having begun January 25, 1881; the road was opened to Aymore, November 9, 1882, and the extension in 1882.

Bahia and San Francisco Railway, from Bahia to Alagoinhas, 76.3 miles. Timbo branch, Alagoinhas to Timbo, 51.4 miles. Gauge, 5 feet 3 inches. This branch was opened for traffic March 30, 1887, and is a separate undertaking, the estimated cost was $1,490,000, on which there is a government guaranty of 6 per cent.; the guaranty on the main line is 7 per cent. This is an English corporation.

Bahia and San Francisco Railway Extension.—Line of road, Alagoinhas to Villa Novada Rainha, 199.6 miles. Gauge, 1 meter. This line is owned by the provincial government of Bahia and forms an extension of the Bahia and San Francisco Railway, northwest from its terminus at Alagoinhas. In 1881, it was in operation from Alagoinhas to Santa Lucia, 112.2 miles. A continuation of this line is now under construction to Joazeiro on the San Francisco River.

Bananal, Rio de Janeiro Railway, from the Sandade station on the Dom Pedro II. line to Bananal, 19.2 miles; opened February 1, 1889.

Brazil Great Southern Railway, from Cuarim River, the dividing line between Uruguay and Brazil, to the town of Itague, on the Uruguay River, 110 miles, all in the province of the Rio Grande do Sul; line was opened for traffic December 31, 1888. It has a government guaranty of 6 per cent. on a capital of £675,000, with reservation of right to purchase after ninety years. It is owned by a British corporation.

Central Bahia Railway, province of Bahia, main line Sao Felix to Queimadinhas, 170 miles, branch, Cachoeira to Feira de Santa Anna, 15 miles. Gauge, 3 feet 6 inches. The construction was begun in 1880, and the line completed in sections; it was opened to Queimadinhas in December, 1885; there is a government guaranty of 7 per cent. on the capital, $7,130,000, for thirty years. The line is projected to the San Francisco River, and stock has been issued for the construction of a branch line to Olhos and Agua. This line is owned by a British corporation.

Campos and Carangola Railway, from Campos to Porto Alegre, 101 miles, Patrocinio branch, 24.2 miles; Itabopoano branch, 13 miles; total completed, 117.2 miles. The main line is projected to Santo dos Tombos on the boundary line of the province of Minas Geraes. Gauge, 1 meter. Construction was begun in 1876, and the first section of the main line opened December, 1878; second October, 1882. This line has a government guaranty of 7 per cent. on $3,375,000 capital for a period of thirty years, terminating March 20, 1905, and is owned by a Brazilian company chartered in 1872.

Companhia Bragantina, Campo Lempo station on the S. B. Railway to Braganza, 32.2 miles. Gauge, 1 meter. Construction and equipment to December 31, 1886, amounted to $35,000 per mile.

* See page 161 for this report.

Companhia Estrada de Ferro Macahe é Campos.—Line of road from Campos to port of Imbetiba, 59.5 miles. This company has a concession from the provincial government of Rio de Janeiro.

Conde D'Eu Railway (province of Parahyba), from Parahyba to Independencia, 60 miles, branch from Cobé Junction to Pilar, 15 miles. Total, 75 miles. The following are projected: Extension of main line to Cabedello, 11.2 miles, to be constructed in one year, extension of branch to Inga, and construction of branch from Malungu to Alagoa Grande. Gauge, 1 meter. British corporation, organized in 1875. Construction was begun in 1882; the road opened to Molungu September, 1883, to Independencia June, 1884; branch line November, 1883. This line has a government guaranty of 7 per cent. per annum on maximum capital of $3,375,000, with option of purchase. Loss on operating for year ending June 30, 1888, $50,000.

Corcovada Railway, from Larangeiras to Mount Corcovada, 2.5 miles.

Dom Pedro Segundo Railroad main line and branches in province of Rio Janeiro, etc., radiating from the city of Rio Janeiro to leading towns of the interior, connecting with all other important lines of railway in the province of Rio Janeiro, Espiritu Santo, Minas Geraes, and San Paulo. Total length, 460 miles. Gauge, 5 feet 3 inches. This road was built and owned by the Imperial Government of Brazil and named after the Emperor Dom Pedro II. Its construction was begun in 1862, in which year 39 miles of main line were opened. Extensions and branches were opened from time to time and constructive operations are not yet closed.

Donna Theresa Christina Railway, from Laguna to Imbetuba and Tuberao (coal mines), province of Santa Catarina, 71.9 miles. Guage, 1 meter. British corporation, organized in 1876. This line has a government guaranty on $3,155,000 capital, with privilege of purchase.

Estrada de Ferro Baturite.—Line of road from Fortaleza, province of Cerea, to Canao; total length, including branches to Alfandega from Maracanahu to Maranguape and the extension from Canao to Baturite, 68.6 miles. Gauge, 1 meter. Owned by the provincial government of Cerea.

Estrada de Ferro de Cantagallo, from Nictheroy to Rio Bonita and to Passageme via Macaco, with branch to Parahyba Corte and San José; total, 165 miles. Gauge, 1.1 meters. This road was owned by the provincial government of Rio de Janeiro, but was purchased in August, 1887, by the Leopoldino Railway Company.

Great Western of Brazil Railway Company, from Recife to Limeoiro, 60 miles; branch from Nazareth to Timbauba, 27 miles; total, 87 miles. Gauge, 3 feet 3⅜ inches. The construction was begun in 1881, and the whole of the main line completed and opened in September, 1882. In 1886 the company undertook an extension to Timbauba without a government guaranty. This is a British corporation and has a government guaranty of 7 per cent. per annum on a capital of $2,812,500, with option of purchase.

Imperial Brazilian Natal and Nova Cruz Railway Company.—Main line from Natal to Nova Cruz, 75 miles. Gauge, 3 feet 3⅜ inches. This line has a government guaranty of 7 per cent. per annum on a capital of $3,091,500, with option of purchase after thirty years. It was operated in 1886 at a loss.

Ituana Railway, from Jundiahy to Piracicaba, 122.4 miles; branch from main line to Itu, 14 miles; total, 136.4 miles. Gauge, 1 meter. Extension to San Manoel projected. The road was opened in February, 1877. It has a guaranty of 7 per cent. by the provincial government of San Paulo.

Leopoldina Railway (province of Minas Geraes), from Porto Novo de Cunha (Junction Dom Pedro II Railroad) via Leopoldina and Sao Geraldo northwest. Total length of completed main line and branches, 184.1 miles; extensions and branches projected, 40.3 miles. Gauge, 1 meter. In August, 1887, this road purchased from the province of Rio de Janeiro the Cantagallo Railway, 165 miles, extending from Nictheroy to Macuco in the province of Rio Janeiro.

Madeira and Mamore Railway, projected along the Madeira River, 205 miles, to carry

* There is published a very finely illustrated description of this road, a railway of perhaps finer construction than any other in South America.

traffic around the falls. A concession was granted by the Brazilian Government to G. E. Church, April 20, 1875, for the building of this road and granted bonds, etc., for the purpose. The estimated cost was about $30,000 per mile.

Minas Central Railway of Brazil, under construction from a point of junction with the Dom Pedro Segundo Railroad, to the city of Pitangui on the San Francisco River, about 150 miles. The concession was granted by the government of the province of Minas Geraes, which guaranties an income of $300,000 for thirty years from the construction of the line, and interest during construction; the company is also guarantied a monopoly for fifty years, during which time no competing line can be built within 18 miles. This line is owned by a British corporation.

Minas and Rio Railway, from Cruzeiro (Junction Dom Pedro Segundo Railroad, Province of San Paulo) to Tres Coracoes (province of Minas Geraes), 105.4 miles. Gauge, 1 meter. This road was opened in 1884, and is owned by a British corporation registered in 1880, which has a government guaranty of 7 per cent. per annum on a maximum capital of about $8,715,000, with option of purchase.

Mogyanna Railroad, from Campinas to Casa Branca, 173 miles, with branches from Jaguary to Amparo, 90 miles; Sertaochino to Ribiero Preto, 90 miles; Mogy to Penha, 13 miles, etc.; total, 341.6 miles. Under construction, 116.5 miles. Gauge, 1 meter. The line is divided into three sections, the first and second are open for traffic and the third is under construction. This line is owned by a Brazilian corporation.

Para and Braganca Railway (province of Para).—Line of road projected from Belem (or Para) to Braganca, 129.6 miles. Completed from Belem 36.6 miles; narrow gauge.

Paranagua and Caratiba Railroad (province of Paranagua), from Paranagua to Morretes, 68.8 miles. Gauge, 1 meter.

Paulo Alfonso Railway (province of Alagoas), from Piranhas to Jatoba, 71.9 miles, following the north bank of the San Francisco River. Gauge, 1 meter. Built and owned by provincial government of Alagoas; opened in August, 1883, and worked at a loss. Total cost, $2,550,000.

Porto Alegre and New Hamburgo (Brazilian) Railway (province of São Pedro de Rio Grande do Sul), from Porte Alegre to New Hamburgo, 26.7 miles; gauge, 1 meter. This line is owned by a British corporation.

Recife and Caruaru Railway (province of Pernambuco), under construction from Recife westward to Caruaru, 68.2 miles; gauge, 1 meter; 47.1 miles are open for traffic.

Recife and São Francisco (Parnambuco), Railway from Cinco Pontas (city of Recife) to Una (or Palmares), 77.5 miles; gauge, 5 feet 3 inches. The construction of this line was begun in 1856 and completed in 1862. It has a Government guaranty of 7 per cent.

Recife and São Francisco (Pernambuco) Extension, from Una to Garanhuns, 90.5 miles, built and owned by the provincial government of Pernambuco. Constructed in in 1882-'85. Gauge, 1 meter.

Rio de Janeiro and Northern.—Concession granted by the Brazilian Government November 4, 1882, runs for seventy years, after which the railroad reverts to the Government. In 1888 an agreement was entered into for the purchase of the property of the Principe de Grao Para Railway Company, comprising 57 miles of road constructed, with 16 miles to be completed about August, 1889. This latter line of road extended from Manua to the city of Petropolis and thence to San José de Rio. A further extension to Entre Rios to connect with the Dom Pedro II Railroad is under construction.

Rio de Ouro Railway, from Quinta do Caja to Rio de Ouro, 33 miles, with branches to Iguassa, 7.4 miles; to Eageagerode Dentro, 933 meters; to Olaire Reis, 274 meters; total length of main line and branches, 40.4 miles. Owned by the Government and used for the purpose of conveying material for the works which supply the city of Rio de Janeiro with water. Gauge, 1 meter. Worked at a considerable loss.

San Paulo Brazilian Railway, from Santos to Jundiahy, 86.2 miles; gauge, 5 feet 3 inches. The construction of this line was begun in 1860, and the line opened February, 1867. The total cost was about $10,000,000. The company has a Government guaranty of 7 per cent. per annum on capital stock of $13,250,000, with option of purchase.

San Paulo and Rio Janeiro Railway, from San Paulo to Cachoeira and junction with the Dom Pedro II Railway, 143.8 miles; gauge, 1 meter. The road was opened throughout July 8, 1877. The provincial government of San Paulo guaranties 7 per cent. per annum on $6,000,000, with right to purchase. The due payment of this interest for thirty years is guarantied by the Brazilian Government.

Santo Amaro Railway, from city of Santo Amaro to Jacu, 22.3 miles; gauge, 1 meter. Owned by the provincial government of Bahia.

Santo Antonio de Padua Railway (province of Rio de Janeiro), from Lucca to Miracema, 57.6 miles. Sold to the C. E. F. Macahe and Campos. Gauge, 2 feet 11½ inches.

São Carlos de Pinhal Railway: 47.7 miles were opened May 2, 1883, and there is under construction 25.5 miles. Branch lines to Brotos and Jahu are under construction, and the Dane Corregas section of the latter branch was opened September 7, 1886. There is now completed in all 163.7 miles.

Sobral Railway (province of Ceara), from Camocim to Sobral, 80 miles. An extension of 61.2 miles to Ipu is projected. This road was built by the Government and was operated in 1884 at a loss.

Sorocabana Railway, from San Paulo to Tieté, 118 miles; gauge, 1 meter. An extension to Botucatu is in progress, and the Cerquiho Laranjai section of same was opened May 24, 1886. The road was opened to Tieté in 1885. This line is owned by a Brazilian corporation. Completed 137.6 miles.

Southern Brazilian Rio Grande do Sul Railway, from Rio Grande to Bagé, 173.6 miles; gauge, 1 meter. Line opened December, 1884. By the terms of the concession the Government guaranties for thirty years 7 per cent. per annum on a capital of $7,605,000, with no competing line within 20 kilometers to be sanctioned for ninety years without the company's consent, but reserves the option of purchase after thirty years.

Taquary and Uruguayana Railway, projected to run from Taquary near Porto Alegre, due west to Uruguayana. From Taquary to Santa Maria 162.40 miles is already completed, between Santa Maria to Cacoquay 71.5 miles more under construction, leaving 164.5 miles yet to be constructed. Gauge, 1 meter. This line was operated in 1888 at a loss.

Unaio Valenciana Railway, Desengano to Rio Preto, 39 miles; gauge, 1.1 meter.

Western Railway of San Paulo (Companhia Paulista de Estrada de Ferro de Oeste), from Jundiahy (junction San Paulo Railway) via Campinas to Belem do Descalvados, 125 miles, with branch from Condeiras via Rio Claro to the Mogy Gassu river at Pinhal, 26 miles; total, 151 miles. Gauge, 5 feet 3 inches. This road was built by a Brazilian corporation without the aid of foreign capital and its total cost was about $32,500 per mile.

There are a number of other lines aggregating 526.6 miles, the most important being the *Oeste de Minas*, 125.2 miles in length. The others are given in the table.

PROJECTED RAILROADS IN SOUTH BRAZIL.

Having been handed a pamphlet upon the projected lines of railroad for the southern portion of Brazil, I have made copies thereof, one of which I inclose, thinking some of our railroad men might like to know what was going on in this part of South America.

The line from San Francisco, just north of this port passing here, thence to Porto Alegre, I believe, is in the hands of an English company, and they expect the final or third passage through the present house of deputies to take place in a few days, when work is to be commenced. The chart will otherwise explain itself.

[Translation.]

ON THE PROJECTED LINES OF RAILROAD IN THE SOUTHERN PORTION OF BRAZIL.

We will divide the execution of the plan of railways herein delineated in the southern part of Brazil into three classes, viz:
(1) Lines of great necessity, "urgent," which we designate "primary."
(2) Lines in continuation of the above, which we will term "secondary" lines.
(3) Ultimately at a more remote period, as the increase of population will warrant, those we will denominate "final" lines of construction.

PRIMARY LINES.

(1) From the best port in the province of Santa Catharina to the city of Porto Alegre, capital of the province of Rio Grande do Sul.
(2) From the western part of Rio Grande do Sul. Porto Alegre to Uruguayana.
(3) Alegrete to Quarahim.
(4) In the southern part of the province of Rio Grande do Sul, from Porto Alegre to Jaguarão.

SECONDARY LINES.

(1) From Sorocaba to the bay of San Francisco, province of Santa Catharina.
(2) From San Francisco, province of Santa Catharina, to the two rivers San Antonio and Pepery-Guassú.
(3) Erom São Gabriel to Jaguarão, passing through Bagé.
(4) From Alegrete to São Borja.
(5) From Bagé to the terminus of one of the eastern lines on the frontier.
(6) From São Gabriel to Santa Anna do Livramento.

FINAL LINES OF CONSTRUCTION.

(1) Those from the ports of Santos, Paranagua, and Desterro, in direction, respectively, of the Colony Douradas, Sete Quedas in Parane, Pepery-Guassu, and São Borja.
(2) The lines from São Gabriel, passing through Santa Maria da Boca da Monte, Passo Fundo, and near to the city of Goyaz, may take direction to a point on the right bank of the Amazon, between 9° and 17° long. W. of Rio de Janeiro. This will be the Central Brazilian line, at some point of which, when partially developed, is destined to be the future capital of Brazil.

The lines above mentioned are to run from the ports of Santos, Paranagua, Sao Francisco, and Desterro in direction west, crossing the future Brazilian central line. It is not impossible, or impracticable, that a line could be constructed running from the port of Valparaiso, taking an easterly course, and finding way over these several lines, to the South Atlantic coast.

In a petition we made to the Imperial Government in 1865, from Paris, we asserted, in order to give the province of Rio Grand do Sul a sure and available communication with the ocean, that it would be necessary to unite the capital by rail with the port of Santa Catharina, and that this line might serve as the common junction for the three great international lines, viz:

First. To bring the city of Montevideo within eighty hours from the imperial capital.

Second. To make the Santa Catharina line the terminus for the ports of the republic on the South Pacific coast.

Lastly. To bring the city of Ascuncion, capital of Paraguay, within four days distance from Rio de Janeiro.

By following this plan the result will be our having three railroad lines terminating at as many different points on the frontier of the Empire.

On account of the extraordinary progress developing within the States on the Pacific coast, thereby enlarging the field of our operations, there is a necessity for these lines to meet those from Cobija, Caldera, or Copiapo, which are in search of outlets, the nearest upon the Brazilian coast, thus establishing great interoceanic lines.

NOTE.—Within the zone embracing the province of Santa Catharina, between the general mountain range and the ocean, is where colonies have been established, which, under different headings, represent a sum of not less than $60,000,000,000 expended by the general government with the intention of developing the interest of this zone. It is here the lands are located which were given to the Imperial Princess as dotal patrimony.

On this continent Washington and the future capital of Brazil, united by a complete system of railroads, shall form the two grand centers, both political and commercial, which shall be the regulator of ideas in this part of the globe.

As the United States of America employ all their efforts to foster through railroads their interest with those of Mexico and the British possessions, so Brazil, with equal energy, should nurse the aspirations of her people in unison with this interest with those of the various independent States on her border.

This we understand ought to be one of the principal objects of those charged with the destinies of the country.

If the traditional policy of Peter the Great of Russia, that the eagle of the Romanoffs should extend its flight to the Bosporus and the Bay of Bengal, that of Brazil ought to bind together intimately the different points of her possessions, and extend her influence to Cape Horn and the South Pacific.

The locomotive is destined to unite the two oceans which border the South American continent, assisted by the two grand water-courses, the Amazon and La Plata. (Report by Consular Agent Comsett, of Desterro, September 10, 1882.)

RAILROADS AND STEAM-SHIPS OF SOUTHERN BRAZIL.

In this province, São Pedro do Rio Grande do Sul, there are at present three railways in operation, and one or two other lines projected for which preliminary surveys have been made.

The lines in operation are, first, Estrada de Ferro do Rio Grande á Bagé, opened for traffic on December 2, 1884; second, Estrada de Ferro de Porto Alegre a Uruguayana, opened in March, 1883, and third, Estrada de Ferro de Porto Alegre á Nova Hamburgo, opened in 1875.

The first line runs from the city of Rio Grande do Sul, in the southern part of the province, along the low sandy shores of Lagoa dos Patos to Pelotas, a city of over 10,000 inhabitants, distant 52.5 kilometers (32.6 miles); from thence almost due west to Bagé, the present terminus—a total distance from Rio Grande do Sul of 280.2 kilometers, or 174 English miles, and within 80 miles of the boundary line between the Republic of Uruguay and the Empire of Brazil.

The road is substantially built; has a gauge of 1 meter, or 1.09 yards, and is laid with heavy T rails, of English manufacture, on hard-wood sleepers, secured with spikes, and ends joined with fish-plates and bolts. It was built, and is at present owned and operated, by an English company. The locomotives are from the famous Baldwin Locomotive Works in the United States, of the "Mogul" pattern, burning Cardiff coal and patent fuel, which is simply very fine coal mixed with some resinous substance and pressed into hard blocks. Passenger coaches are of two classes; those for the first-class passengers were made in the United States and on the American plan, and those for second-class passengers were made in Europe, but on the same plan as the first-class coaches. The traffic, or freight cars are of Brazilian make, being light and short, mounted on a single truck at each end. It is expected to extend this road to the Brazilian boundary.

The latest published official returns showing the receipts and expenses of the road are for the year 1886, in which year its receipts were, reduced to United States currency, $329,645, and expenses, including improvements, $306,364, leaving an unexpended balance of $23,281. In that year it carried 105,465 passengers of all classes, and 20,735 tons of freight. First-class passenger rates from Rio Grande to Bagé are $10; round trip, $15. Freight is divided into five classes under the tariff list of the company. For first-class freight the charge is $28 per ton from Rio Grande to Bagé, and for fifth-class, $6.70 per ton. The road was built at an average cost of $37,000 per mile, under a guaranty by the Brazilian Government of 7 per cent. per annum on the capital stock subscribed; provided, however, so much is expended annually in extending the line or on improvements of the line already built by the company, which improvements are under the control and direction of the Government's agents, termed fiscal engineers.

If the operating expenses should exceed the receipts, the 7 per cent. guaranty by the Government is first applied to the payment of that deficit, and if not sufficient to discharge it, the Government's responsibility extends no further. A number of subscribers to the capital stock were under the impression that the guaranty of 7 per cent. per annum by the Brazilian Government was unconditional, but they have since learned differently; for last year a dividend of 5 per cent. only was declared, which is practically a deficit of 2 per cent. on the gross receipts of the road.

The second road, when completed, will run from Porto Alegro, the capital of the province, in the central eastern part to Uruguayana, on the Uruguay River, a distance of 378 miles. However, it is not completed over two-thirds of the way, the work of track-laying progressing slowly. This is the central road of the province, dividing it east and west into two nearly equal parts, and when completed will con-

nect the capital, a city of 40,000 inhabitants, with the Argentine Confederation at Uruguayana, where the Brazilian Government has a custom-house. It is owned and operated by the Government and is 1 meter in gauge. I know nothing of the engines and cars.

The receipts for the fiscal year 1886 of this road were $219,063; expenses, $254,310, leaving a deficit of $35,247; number of passengers, 40,515; freight, 34,701 tons.

The third and last line in operation is a short one, 26 miles in length, connecting the capital with New Hamburg, a large German settlement. It is owned by an English company, and in 1886 had a deficit of $1,878 but I am informed that under its recent management it will pay a small dividend this year.

Some time since a survey was made by the Government for a road from Porto Alegro to the port of São Francisco, in the province of Santa Catharina, the object of which was to give an outlet to the sea for the northern and western part of the province without passing through Lago dos Patos over the Rio Grande bar. This survey has been retracted by the Government, as the road it now operates does not pay expenses.

The sum of $100,000 has been subscribed by citizens of this city and Pelotas for the building of a steam tramway running from the suburbs of this city to the sea-shore, a distance of 11 miles, where extensive grounds will be arranged for a pleasure resort. This road will be built, the name of the company being Companhia de Binds suburbanos de Mangueira. (Report of Lebbeus G. Bennington, consul at Rio Grande do Sul, July 9, 1888.)

BRAZILIAN RAILROADS.

At the close of the year 1887 there were in operation in Brazil 5,222 miles of railroad, of which 1,251 belonged to the general government, 59 to provincial governments, and 3,912 to companies and individuals. Of the last named, 1,340 miles were built without assistance from the general or provincial governments. The provincial governments aided, either by subsidies or by guarantying interest on the capital invested, in the construction of 972 miles, and the general government is responsible for interest on the capital invested in 1,600 miles.

At the same time there were in construction 870 miles of railway, of which about 450 miles it is estimated have since been completed, making the total length of the railways in operation in Brazil nearly 5,700 miles.

Nearly one-fourth of the total mileage is in the province of Sao Paulo, and it is in this province that railroads are most prosperous. At the close of 1886 there were in the province eight railroads whose total length was 1,124 miles, besides a part of the principal government road, the D. Pedro II. The cost of building these eight roads was $49,498,000. Up to that time the general government had expended on them in the form of guarantied interest the sum of $7,364,040, of which $2,473,420 had been repaid. The provincial government had expended $3,752,185, the amount repaid being $234,403. The operating expenses of the eight roads in 1886 were $4,263,252, and the receipts $8,399,595.

Outside of the province of São Paulo there are few prosperous railroads in the Empire. Of those belonging to the Government the only one that pays a reasonable interest on the capital invested in it is the D. Pedro II. This road, which in 1886 was 463 miles long, had cost up to that time $53,833,000. In that year the operating expenses of the road were $3,534,082 and the receipts $6,304,983.

On none of the other Government roads were the receipts that year sufficient to pay operating expenses. These expenses amounted to $1,112,370, while the receipts were only $773,450. The cost of these roads, which were at that time 704 miles long, was $48,180,000.

Of the roads receiving Government aid there are some which have drawn from the State in guarantied interest a larger sum than the original cost of construction. These roads, which in 1886 were 1,445 miles long, had cost up to that time $94,113,000. At the close of 1887, when the length of these roads (seventeen in number) was, as has already been stated, 1,600 miles, the companies owning them had received from the Government in guarantied interest the sum of $61,757,828.

From these figures it will be seen that the large increase in the annual expenditures of the Government and, consequently, in the public debt and the burdens of taxation is partly due to the liabilities incurred in promoting the construction of Government and assisted railroads.

On the other hand, it is undoubtedly true that the railroads so constructed have contributed to stimulate production, promote progress, and increase the annual revenue of the Government.

The data of which I have made use in treating of railroads had to be drawn from various sources, there being no single work in which recent and complete information can be obtained. This remark applies with still greater force to the statistics

of manufacturing industry in this country. (Report by Consul-General Armstrong, Rio Janeiro, June 1, 1889.)

Under date of August 31, 1889, Consul Borstel, of Pernambuco, reports that the contract to build a new railroad in the province of Piauhy, in this consular district, has been awarded to Dr. Newton Coyar Bustlamaqui, a Brazilian. This line will be narrow-gauge, and will begin in the city of Amarante, a small sea-port town in the above-named province, and run to the sierra called Dais Amaas, or Two Brothers, in the same province, a distance of 700 kilometers, or 140 leagues. Dr. Bustlamaqui has an additional contract to carry on the line from the said sierra to the city of Petrolina, on the banks of the River San Francisco, in the province of Pernambuco, a distance of 200 kilometers, or 40 leagues. This is thesame line of which some meager account was sent in my dispatch No. 33, of April 14, 1888. The estimated cost of the line is $12,000 per kilometer, or close to $10,000,000 for the whole line. The Government guarantied 6 per cent. yearly upon the capital expended until the line is finished to its satisfaction.

BRITISH GUIANA.

Demarara Railway, from Georgetown to Mahaica, 20 miles. This line is owned by a British corporation organized in 1845. The road was completed and opened throughout its entire length, September 1, 1864, and has a gauge of 4 feet 8½ inches. The net earnings for 1888 were $67,145.

The surveys for the Nicaragua Canal have covered the territory in the western part of the State of Nicaragua, and these show to the country be very favorable for railway building.

Here again there is a large proportion of the population in the cities of Leon, Managua, Granada, Rivas, etc. The Nicaragua Railway having a general direction parallel to the coast may be used in the through line. At the Goascoran, the line will be about at sea-level and little change in elevation will be required from this point almost to the Isthmus of Panama.

Crossing the Goascoran, the line will skirt the Gulf of Fonseca, passing through the State of Honduras, the town of Choluteca, crossing the Rio Negro, and thence to the nearest point, Chinandega, of the Nicaragua Railway. The distance through Honduras will be about 90 miles to Chinandega, or about 120 miles from San Miguel. The Nicaraguan Railway consists of two sections, 58 miles and 32 miles each in length, communication between them being carried on by a line of steam-boats on Lake Managua, but they could easily be united by a line of railway. About 45 miles only of the first section can be used in the through line from Chinandega to Momotombo. From Granada, the southern terminus of the Nicaragua Railway, the Intercontinental line would then follow the shores of Lake Nicaragua to the city of Rivas (or Nicaragua), 150 miles from Chinandega, and still following the lake would cross the frontier line of Costa Rica.

Here the question arises as to whether the Pacific or the Atlantic slope should be followed. It is reported that a syndicate has been formed to build a line from Jimenez, on the Costa Rica Railway, northwestward to the mouth of the San Carlos River, and that the concession has been granted by the government. A concession has been granted very recently for another line from Esparta northwestward to the Nicaragua boundary. The general line may take either of these: the Atlantic or the Pacific coast being followed to the isthmus, or the Pacific coast to Esparta, thence across the State by the line now almost completed to Matina and from there south along the Atlantic coast.

While the latter would pass through the most populous region, it would be longer than either of the others, and the grades of the Costa Rica Railway are heavy. The distance from the northern to the southern boundary is the same by either of the other routes, but it is believed that the Atlantic slope is richer both in agricultural and mineral productions, and hence would no doubt be better for the through line. From the Nicaragua boundary the line would reach the nearest point of the San Carlos line, thence to Jimenez on the Costa Rica Railway, thence to Matina, and southward along the coast. From the southern terminus of the Nicaraguan Railway to Jimenez is about 210 miles, of which about 75 miles will be along the San Carlos line. From Jimenez to Matina is about 33 miles, and from Matina, to the frontier about 130 miles.

Thus to carry communication through Central America from the City of Mexico requires about 1,700 miles of railway, of which 293 miles are already constructed and in operation, 780 miles are under construction and survey, and 625 remain still to be located. The figures for the line through the interior are slightly different, but in each case they can only be approximate on account of the inaccuracy of the maps. Few surveys have been made, and those are confined to some route proposed for a railway or a canal.

The elevations, as has been said, from San Miguel in Salvador, all the way to the southern boundary of Costa Rica, do not change much, and hence the grades will probably be light. There are a number of rivers, but it is believed that none of them would require long or expensive bridges. The engineer's estimates for the Costa Rica Railway were $37,500 per mile, and this in the difficult part; hence the average cost of the International line from the City of Mexico through Central America would probably be no greater. The traffic which it would reach would undoubtedly be remunerative, for all these countries are very rich both in agricultural and mineral resources.

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By a glance at the map of South America it will be seen that its railways lie upon the outer border, with the exception perhaps of the projected line around the rapids of the Madeira River. In the south the railways of Chili, Argentine, Uruguay and Paraguay, and Brazil are already so united, or soon to be united, as to form great systems. Lines also have been projected in Peru and Bolivia which will eventually unite with those south of them, carrying rail communication as far north as Cuzco, in Peru, about 2,189 miles from Buenos Ayres. North of this little has been done that will be of use in the Intercontinental line.

Taking up the line at the boundary of Costa Rica, it must from there traverse the Isthmus of Panama to reach the commerce of the southern continent. Very little is known of the topography of the isthmus beyond a few miles on either side of the routes surveyed for interoceanic canals. However, these indicate that grades need not be difficult—although the experience of the Panama Railroad would show that there are many other difficulties to be overcome. The important point in this locality is, therefore, the saving of distance. The line, beginning on the north side, will cut some convenient point cross to the south side, thence by the shortest distance to Quibdo, or some other convenient point in Colombia. Surveys may show that it is better to follow the north side of the isthmus. In any case the road must be built in the foot-hills to avoid the numerous water-courses and the low and marshy lands.

Having reached the Continent, there are several general routes open for choice, which for convenience will be called:

(1) The coast.

(2) The eastern slope of the Andes.

(3) The interior.

(4) The central plateau.

No. 1. The Andes in the north approach very near to the Pacific; the coast, except in the south, is thinly inhabitated, and is not the productive area of the continent, and hence would be unfavorable, except perhaps from the city of Guayaquil in Ecuador southward. Even upon this part there are objections to the selection of this route because of the proximity of water transportation and because the central plateau and the eastern slopes of the Andes are the populous and fertile regions of this portion of the continent. Yet it will be noticed that the Chilian railways form an almost unbroken line for 1,500 miles, and that Peru has numerous short lines which might be united. The coast line would be beneficial when these countries become more thickly settled and better developed.

No. 2. The line may be carried to the eastern slopes of the Andes and thence southward, but it would traverse a country without roads and with few inhabitants—a country thickly covered with forests and crossed by many streams, along which communication is maintained to the foot of the Cordilleras from which trails lead to the plateau. While this line would pass through a rich country where traffic might possibly be developed, yet difficulties of construction or even of location seem to be such as to render it almost impossible. If the line, however, is so located it should follow the dividing line of two water-sheds, cross the Amazon, and then take its course toward the northernmost point of the systems of the countries to the south, most likely Cuzco or Cerro de Pasco in Peru. At the latter of these there is a pass in the Cordillera through which traffic passes to reach the head of navigation in the Amazon. The line would thus descend from an elevation of about 12,000 feet in Colombia to 400 feet on the Amazon and ascend again to about 11,000 feet at Cerro de Pasco or Cuzco.

No. 3. The interior route, on account of the immense breadth of the rivers, their number, the density of the forests, and the lack of population, is almost out of the question. While this country is undoubtedly very fertile it is almost entirely unknown; but when it becomes known and more thickly settled this route would be valuable, because it reaches in the shortest distance the populated regions of the Southeast.

No. 4. There remains, then, the route by the central plateau, against which fewer objections seem to exist than against any of the others. It would reach throughout its length the most thickly settled portion of the continent; it would reach all its mineral wealth and connect with nearly all the railways so far projected, and besides there are but a few points where great difficulty would be found in the location. One of these has already been mentioned, near Popayan in Colombia; another is between Pasto and Ibarra in Ecuador, and another near Loja in Ecuador, all caused by lateral ridges of the Andes. One of these might be avoided by crossing the Cordillera in Ecuador to Macas, thence south along the eastern slope to Moyobamba, and thence to Cerro de Pasco.

The line through Colombia may follow two routes: The valley of the Cauca or the valley of the Magdalena. The Cauca Valley is more fertile and thickly inhabited, and being nearer to the Isthmus will require less construction than the intercontinental line. It may, however, be deemed desirable to reach Bogotá, the capital, which might be done by a branch, the main line being carried along the Cauca. A branch might also be extended to Venezuela. The Antioquia Railway, already partly constructed, could be used as part of it. The Cauca Valley is spoken of more favorably by Colombians than the Magdalena, although lines to Bogotá have been projected and a French syndicate is endeavoring to obtain a concession for this. Whichever valley is followed, a portion of Colombia is reached about which very little is known. The old Spanish road extends from Popayan, at the head of the Cauca, southward along the central plateau, but nothing is known about the country southward from the Magdalena across the Cordilleras. This is one difficult portion of the proposed line, and how difficult it is impossible to estimate.

The line may then be described as follows: Leaving Quibdo in Colombia, the Cauca Valley would be entered at the first available opening in the Cordillera, and would be followed with an ascending grade to Buga, Cartago and Popayan; then, crossing the lateral ridge, enter the plateau proper, passing through Pasto and Ibarra to Quito. A railway has been projected to this point from Sibambe, 150 miles south, to which point the line from Guayaquil is now being constructed. From Sibambe the through line may go to Cuenca and Loja, thence into Peru and the valley of the Marañon, and to Cerro de Pasco, where it will meet the line projected from Oroya. From some point on this line a branch is projected to Jauja, from which the Intercontinental Railway will go by the best route to Cuzco, where it will join the Mollendo, Arequipa and Puno Railway, of which a portion only has been constructed. When completed this line may be taken to Puno, from whence another line has been projected to La Paz in Bolivia. The portion of the Puno road referred to is about 92 miles in length, From La Paz a line is projected to Oruro and Huanchaca, from which point the projected line goes in two directions—one towards Antofagasta, the other southward to meet the Argentine line from Jujuy. The line from Antofagasta is under construction towards Huanchaca and the greater portion is built. The line from Jujuy is now within 120 miles of the Bolivian frontier.

The distances can be only approximately determined, except in the southern part. By measurement upon the maps I have obtained the following: From the frontier of Costa Rica through Quibdo the Cauca Valley and Popayan to Quito is about 985 miles; from Quito to Cerro de Pasco is about 805 miles; from Cerro de Pasco to Cuzco is about 350 miles; from Cuzco to Puno is 272 miles, Puno to La Paz 162. La Paz to Potosi 342, Potosi to Jujuy 420, Jujuy to Buenos Ayres 993, or from Cuzco to Buenos Ayres 2,189 miles.

From Cuzco in Peru to the railways of Costa Rica, about 2,300 miles, is the one long link which the Intercontinental line will be called upon to construct, for from Cuzco south to Buenos Ayres or Valparaiso it will be seen that railways are already built or projected.

The general elevation will be about 7,000 or 8,000 feet above the level of the sea. *It rises in* the Cauca Valley to perhaps 14,000 feet, sinks again in Ecuador,

rising to pass the lateral sierras, reaches its lowest level at the Maranon, and rises again to reach the great table-land of Bolivia.

To sum up: From the southern terminus of the railways in operation in Mexico to the northern terminus of the Argentine system is about 4,900 miles. In this distance there are already constructed about 230 miles which can be used in the through line, 1,800 miles are under construction and survey, and there remain 2,870 miles to be located in order to complete the line that will eventually unite the republics of the Western Hemisphere.

A more accurate statement of the location can not be made from present knowledge of the subject. Surveys are necessary; general, in order to give a more complete idea of the topography, and particular for the exact location of the line. Much of the country to be traversed is unknown; of the rest but few surveys have been undertaken.

A branch line has been projected in Bolivia from Oruro to Cochabamba. A line has been projected from Santa Cruz to the Paraguay. If these are built with a connection between Cochabamba and Santa Cruz, the commerce of Paraguay and Brazil will be reached. The line from the Paraguay is to go to Sucre, and might be extended to Potosi and Uyuni, joining at that point the Bolivian railways.

The route by the central plateau touches a number of transandine lines: The Cauca Railway, in Colombia, from Buenaventura to Cali, partly completed; the railway in Ecuador from Guayaquil to Sibambe, soon to be completed; the Oroya and Arequipa lines in Peru, now complete; and the Antofagasta and the Valparaiso lines, approaching completion.

Another route for the intercontinental line deserves mention. The Brazilian railways cover, more or less, the eastern coast of the continent. If these were joined and carried northward they would approach the Amazon. The Venezuelan lines are being connected with each other and are projected toward the interior. The Orinoco and the Amazon then form the only barrier between the railways of Venezuela and those of Brazil, but one which may almost be considered impassable.

SURVEYS.

It was stated that the information relating to the topography of the Spanish American countries is very limited. This is true of all these countries with perhaps one or two exceptions. Much of their area is unexplored, and few general surveys have ever been undertaken. Maps of each country are published, but they are on small scales, they differ greatly among themselves, and few are reliable, as the records of travelers show. A far better idea of the topography is obtained by reading books of travel; even this information is to be taken cautiously unless the writer is accustomed to accurate observation, consequently only general ideas can be formed of this portion of the Western Hemisphere.

The exceptions are where surveys have been undertaken for some particular purpose as a railway or interoceanic canal. It may be safely said of these, however, that little is known beyond ten miles on either side of the canal or railway line, and especially is this true of the canal lines, where the object was not a topographical survey, but merely the finding of a single line, which might be used for a canal. Some parts of these countries are inhabited by Indian tribes hostile to foreigners, other parts are sterile and bleak thus discouraging travel.

The lack of topographical information may be supplied by general surveys. This is done in the older and more thickly settled countries in various ways.

ORGANIZATIONS.*

In Great Britain the survey is called the ordnance survey, and is carried on by officers of the royal engineers, Lieut. Gen. Sir Henry James having been for many years at its head. December 31, 1874, there were employed on it 19 officers of royal engineers; 4 companies of royal engineers containing 121 non-commissioned officers, 243 sappers and 8 buglers, 1,000 civil assistants of different grades, and 448 laborers.

In Prussia the trigonometrical, topographical, and chartographical work is intrusted to the staff corps of the army, while the geodetic work in connection with the "European measurement of degrees" is in charge of the Geodetic Institute, whose head is Lieut. Gen. J. J. Baeyer. In 1875, 43 staff officers were employed on the survey, together with a large number of gunners, civil assistants, and laborers.

In Austria, the survey of the empire is intrusted to the Military Geographical Institute, an organization which has a general at its head and is under the war department. Its members are officers, military officials, civil assistants, non-commissioned officers, and workmen. In 1875, it employed 1,258 persons, of whom 283 were army officers varying in rank from lieutenant to major-general.

In Italy, the surveys, prior to 1873, were carried on by officers of the staff corps under the chief of staff; but then the survey was given a more independent organization under the title of "Military Topographical Institute." Its present director is Major-General de Vecchi.

In Spain, the surveys are controlled by the Geographical Statistical Institute, with Major-General Ibañez at its head, and are largely carried on by officers of the army. In 1871 there were about thirty geodetic and topographical parties employed.

In Switzerland the Surveys are under the direction of Colonel Siegfried, chief of staff of the army.

In Sweden, the geodetic and topographic survey is carried on by the officers of the general staff of the army. Its head is the chief of the topographical division, at present Colonel von Vegesack.

*Report of the Chief of Engineers U. S. Army for 1876, p. 127.

In Russia, the military topographical corps is charged with surveys. Its organization is: 6 generals; 33 majors, lieutenant-colonels, and colonels; 150 cornets, lieutenants, and captains; 170 classed topographers; 236 topographers, of sergeant's rank; 42 apprentices.

The main divisions of the work of a European state survey are usually three, the triangulation, the topography, and the chartography. When it is practicable, the triangulation precedes the topography, and includes the primary, secondary, and tertiary triangulations and their computations.

If the triangulation points thus determined are numerous, as in the Prussian surveys, additional triangulation by the topographer will not be needed; when, as in Austria, comparatively few points are determined, the topographer will have to base on them a smaller triangulation for his detailed work.

The topographers having been furnished with the positions of certain points within the area to be covered by one of their topographical sheets, make a survey of that area, whose amount of detail will depend on the scale or object of the survey. Their work includes the determination of the required level-curves.

The topographers' sheets go to the chartographic division, whence they are either reproduced on the same scale or reduced to a smaller scale, and the maps resulting from them are published.

METHODS.

It is only within the present century that the methods of geodetic and topographic surveying for large areas have reached high precision. Previously the chief spur to the production of accurate maps was their necessity for military purposes. In some states progress beyond this need has scarcely been made as yet, and the maps give no more detail than is needed for the movement of troops; in others, and notably in Great Britain and Germany, the progress in civilization, the needs of the government, and the dense population, have required and have obtained the adoption of systems of topographical survey and publication, which are sufficient for all rational demands.

Aside from the military uses of maps, uses that in Europe must long be among the most important, the increasing intelligence of man in civilized countries demands an accurate knowledge of the earth's surface in his vicinity; a surface that, while slightly modified by his action upon it, yet retains the same principal features from age to age, so that one good survey, with slight occasional corrections, will suffice for an indefinite period.

Where the survey is on a large scale it serves another purpose, by giving, with sufficient accuracy for the imposition of taxes, the areas of all estates, and may, indeed, be made a basis for land titles. This, however, requires a larger scale than is necessary for ordinary purposes. In England, such maps, called parish plans, are on a scale of $\frac{1}{2500}$. In many European states, cadastral surveys have been made frequently without connection with a topographical survey, their object being the proper apportionment of land-taxes.

Again, when an accurate survey of a country is made, it will aid in the preliminary examinations for works of engineering, such as railroads, canals, river improvements, although no general survey could properly give the detail necessary for the final location or construction of such works.

In nearly all the European states the area over which the survey extends is covered by a net or chains of triangles of large size, the lengths of whose sides vary from 10 to 100 miles, and depend on bases measured with the highest precision that it is practicable to reach; their probable errors not exceeding about $\frac{1}{200000}$ part of their lengths. In some states all the angles of this net are observed with extreme precision, so that the probable error of any angle shall not exceed a few tenths of a second; in others, as in Italy and Spain, certain chains of triangles, 100 or 200 miles apart, running north and south and east and west, thus forming large quadrilaterals, are observed with the greatest precision, the intermediate triangles receiving less care. At the vertices of several of the triangles accurate determinations of latitude and longitude are made, and the azimuth of a triangle side is determined. The heights of the ground above the level of the sea at all vertices are found either by levelings of precision, or trigonometrically. The positions of these vertices are thus accurately known in latitude, longitude, and elevation; they are the precise reference points on which all the inferior points depend.

Starting from the triangle sides of the primary triangulation, the interior of each such triangle is cut up into a smaller triangulation, called secondary, and the secondary triangles, if necessary, into still smaller ones, called tertiary. The vertices of the tertiary triangulation are the guiding points of the topographer; on them he bases his sheets.

Thus, in Austria two or three such points at least are required for every sheet covering $7\frac{1}{2}$ minutes of latitude and 15 of longitude, on a scale of $\frac{1}{28800}$, with one or two

additional ones on the sheet, but perhaps outside of the border. This gives one point for each 60 square kilometer (24 square miles.)

In the Prussian surveys 10 trigonometrical points are required for each 56 square kilometers (22 square miles), scale of detail sheets $\frac{1}{25000}$.

In Italy the scale used being $\frac{1}{50000}$, one trigonometrical point is determined for every 25 square kilometers (10 square miles).

The heights of these points are also determined and given to the topographer, who bases on them his level or contour curves.

The determination of points on which the topographical survey depends has now been explained. If possible, those determinations should be made in advance of the topographical work. Where that is impossible the topographer must leave permanent marks in prominent positions, which are afterward determined from the triangulation.

On the Continent the topographical work is done mainly with the plane table, the amount of detail introduced depending on the scale adopted. Thus, in Prussia, where the scale of the plane-table sheets is $\frac{1}{25000}$, all necessary detail can be given. Roads, paths, mills, detached houses, important fences, streams, ponds, forests, bridges, mines—all can be shown. When the scale is diminished to $\frac{1}{50000}$, as in Italy, a part of this detail must be omitted, and still more when the scale of publication is diminished, as in Sweden, to $\frac{1}{100000}$.

In all the best modern surveys, even when hachures are used to give pictorial effect, the relief of the earth's surface is shown by level or contour lines, at elevations differing with the precision of the survey.

In the Prussian sheets, scale $\frac{1}{25000}$, the level curves are 20 or 25 feet apart in elevation. The Swiss sheets, scale $\frac{1}{25000}$, give them 10 meters apart. In the Austrian surveys at least eight heights are determined in each square kilometer for the scale $\frac{1}{25000}$, and seventeen for the double scale. The level curves are drawn at either 20 or 100 meters apart.

In the publication of the results of surveys, the scale $\frac{1}{25000}$, adopted by Prussia throughout, and by Switzerland, except for the most mountainous area, appears sufficient for all ordinary purposes. It permits the measurement of distances to within 15 feet. It gives much more detail than the scale of $\frac{1}{63360}$, at first adopted for the British maps; and their map now being published on a scale of 6 inches to the mile, or $\frac{1}{10560}$, while not large enough to give well the boundaries of estates, yet requires six times as many sheets as the scale $\frac{1}{25000}$ would do.

The scale $\frac{1}{25000}$ furnishes also an admirable basis for detailed geological work, enabling the geologist at once to place on maps of sufficient detail the results of his labors, as is being done in Prussia. Indeed, the general topographical and geological maps of that country now in progress present to us a standard of excellence which can only be attained after many years.

The detailed sheets need combination for general use into maps of a smaller scale. General Dufour adopted $\frac{1}{100000}$ for his excellent map of Switzerland, and the same scale is adopted for the general staff map of Prussia, derived from the $\frac{1}{25000}$ sheets.

In reference to the cost of these surveys per square mile, save in the case of Prussia, there is little information. In that country there are about 200 square Prussian miles (4,380 square miles) covered annually by triangulation, costing $78,000 gold. The topography covers the same area per annum, and, with cartography, costs $117,000, gold, per annum. Dividing the total expense, $195,000 gold, by 4,380, we have $44, gold, per square mile as the cost of the survey, exclusive of topography done by contract at the rate of 700 or 800 francs per square stunde, or $16 to $18, gold, per square English mile. The cost of triangulation, revision, and publication would have to be added to this. Half the cost of the new Swiss survey is borne by the Confederation and half by the cantons.

Publication on the scale of the field-sheets only takes place when some society or person agrees to bear half the expense. Austria expends annually about $490,000 for her surveys, but the area covered is not known. It is stated that in the Austrian surveys an officer experienced in topography can, with the aid of two or more soldiers, survey in the six summer months, on a $\frac{1}{25000}$ scale, from 350 to 500 square kilometers (140 to 190 square miles), drawing the same in colors during the winter.

Schiavoni, in Principii di Geodesia, states that a topographer in six months can complete 81 square kilometers, the scale being $\frac{1}{20000}$. The wide difference in these estimates is doubtless due in part to difference in precision of the work, although the scales are nearly the same.

A writer in the North American Review of July, 1875, estimates the total cost of the ordnance survey of Great Britain up to that date at about $20,000,000, in gold, and the area at 111,000 square miles. This would give a cost of $190 per square mile, the work not yet being complete. It should be remembered that it includes many publications on scales larger than $\frac{1}{25000}$.

Taking the Prussian survey as a model, and recollecting that the cost, $44 per *square* mile, previously stated, does not include the pay of officers, nor (probably)

the cost of the Geodetic Institute, which has charge of the primary triangulation and astronomical work, these two omissions, perhaps, increasing the cost of the work to $60 or $65, it is very doubtful if similar work in this country, on account of the greater cost of labor, both skilled and unskilled, could be done for less than $100 gold per square mile.

If a lower standard of accuracy were adopted, such as determination of but one triangulation-point in 25 or 50 square miles, level curves 100 feet apart, field-sheets on a scale of $\frac{1}{10000}$, and published maps on a scale of $\frac{1}{100000}$, the cost might perhaps be reduced to $50, gold, per square mile. For level, thickly settled areas, with numerous telegraph lines, the cost of the first and less precise maps might be further reduced by substituting astronomical for trigonometrical determinations of the guiding points. But when at last good topographical work was to be done, trigonometrical points would still be necessary.

To supply the information necessary for the location of an intercontinental line by any of these methods would take a great length of time. It must be done more quickly and for the definite purpose of railway location.

In several of the South American countries the government engineers, or engineers employed especially for the purpose, have surveyed lines between all the important points in the State, which are to be used if railways are ever built.

Even this method does not supply sufficient information, for there must be unity of action between the engineers of the several States, or else engineering parties must be sent out for the especial purpose of making the surveys for international and intercontinental lines.

It could not be considered extraordinary for any one country to undertake this survey, although an agreement between the interested nations with a sharing of the expenses would no doubt be a better plan.

The United States has always encouraged expeditions and explorations, whose object was either to increase scientific knowledge or to promote its trade with other countries. It has fitted out many to make surveys and explorations in other countries and for other scientific purposes. The following are a few of the more noteworthy instances:

In 1834 Charles Biddle was sent to Central America as a special agent to investigate plans, estimates, etc., for an interoceanic canal.

Act of Congress May 14, 1836, authorized the President to send out a surveying and exploring expedition to the Pacific Ocean and the South Seas, and appropriated $150,000 for expenses. This expedition was commanded by Commodore Wilkes.

President Pierce, in 1853, authorized the Secretary of the Navy to send Lieut. Isaac Strain to make surveys of a canal route by way of Nicaragua. Expenses were paid by the Navy Department.

In 1853 Lieutenants Gibbon and Herndon, U. S. Navy, made exploration of the Amazon River to its sources.

In 1853-'54-'55-'56 Commander Thomas G. Page, U. S. Navy, made explorations of the La Plata River.

Act of Congress March 3, 1857, appropriated $25,000 and authorized the Secretaries of War and Navy to employ such officers of the Army and Navy as might be necessary to make explorations for a ship-canal by way of the Atrato and Turando Rivers. The survey was made by Lieut. N. Michler, of the Army, and Lieut. T. A. Craven, of the Navy.

In 1860 Congress appointed a committee of Army and Navy officers to examine the Chiriqui route for a canal.

Act of Congress April 17, 1866, directed a survey, under the Secretary of the Navy, of Behring Straits and the China Seas, for the benefit of American shipping.

Act of Congress July 28, 1866, appropriated $40,000 for a survey of the Isthmus of Darien, under the War Department.

Act of Congress July 12, 1870, directed the President to send an expedition toward the North Pole for scientific objects, under instructions from the National Academy of Sciences, and appropriated $50,000 for the expenses.

Act of Congress July 15, 1870, appropriated $30,000 for an examination and survey,

under the direction of the president of the Tehauntepec and Nicaragua routes, to ascertain the practicability of canals.

Act of Congress, May 18, 1872, appropriated $20,000 for the completion of the surveys of the Tehauntepec and Nicaragua routes, and $5,000 to complete the survey of the Darien route. Under the acts of 1870 and 1872 a number of surveys were made by the Navy Department.

A commission composed of General Humphreys, Mr. C. P. Patterson, of the Coast Survey, and Commodore Ammen, of the Navy, was appointed March 13, 1872, to report upon the results of these surveys.

Acts of Congress, March 13, 1849, March 3, 1853, May 31, 1854, August 4, 1854, appropriated in all $144,200 for surveys by army engineers for the Pacific railroads in the United States.

Acts of Congress appropriated money for Arctic explorations made under De Haven, De Long, Franklin, and Greely.

An Antarctic expedition was sent out either by the Navy Department or under a special appropriation.

RAILWAY GAUGES.

The selection of a gauge for the Intercontinental line is not so unimportant a matter as it would seem.

In the United States there is but one great narrow-gauge system, the Denver and Rio Grande Railway, and it is rumored that this may be converted to standard gauge. A large loan has recently been obtained by the Mexican National Railway for the purpose of changing it to standard gauge. In Mexico the greater portion of the mileage is 4 feet 8½ inches; in Central America it is 3 feet, or slightly greater; in South America most of the Argentine railways have a gauge of 5 feet 6 inches; those of Brazil 1 meter, or 3 feet 3⅜ inches; in Chili it varies from 2 feet 6 inches to 5 feet 6 inches; in Colombia most of the roads are 3 feet; and in Peru 4 feet 8½ inches.

From a comprehensive review of the history and development of the railway gauges of the world the following particulars in regard to the gauges of the world are extracted. It was agreed in England about 1848 that a uniform gauge 4 feet 8½ inches should be used on all roads, except those already served by 7-foot gauge. The first German road, from Nuremberg to Furth, was built with 4 feet 8½ inches gauge, which is now used by all the principal roads of Germany, although there is a very considerable mileage of narrower gauges, mainly 1 meter, or 3 feet 3⅜ inches. France started her roads with a width between rail centers of 4 feet 11 inches, which has led to some slight variations of gauges according to rail width. The later roads have been built with a gauge of 4 feet 8½ inches. Holland began with a 6 foot 4 inch gauge, but has now altered all its roads to 4 feet 8½ inches. The railroad congress at Berne, in May, 1886, adopted the following resolution, which is to apply to Germany, Austria-Hungary, France, Italy, and Switzerland: "The gauge of railroads measured between the inner edges of the rail heads shall, for roads built or altered as to gauge after this resolution takes effect, not be less than 4 feet 8⅜ inches on straight lines, nor more than 4 feet 9⅜ inches on curves."

In Russia the first road opened, in 1832, from St. Petersburg to Zarskoe-Selo, about 16 miles, had a 6-foot gauge. When the second road was made, in 1842, from St. Petersburg to Moscow, the Czar, at the instance of our countryman, Major Whistler, fixed the Russian gauge at 5 feet, which increase over the English gauge was thought desirable for locomotive purposes. Major Whistler thought as wide a gauge uncalled for. The 5-foot gauge has continued the standard in Russia; but that it is not made different from the German gauge for military reasons seems to be proved by the fact, instanced by Herr Claus, that the lines built under imperial direction from Warsaw to Vienna and from Warsaw to Bromberg—the Berlin line—were carried out with the German gauge.

Ireland has a standard gauge of 5 feet 3 inches; Spain and Portugal, 5 feet 6½ inches. Sweden and Norway have the 4-foot 8½-inch gauge over the majority of their railroads; but 20 per cent. of the Swedish roads have gauges varying from 2 feet 7½ inches up to 4 feet. Norway has 592 kilos of standard gauge, and 970 kilos of 3 feet 6 inch gauge.

In Asia, of the British-Indian roads, with a collective length of 12,366 miles, about 7,450 miles have a gauge of 5 feet 5½ inches, the remainder being divided among 6 gauges from 2 to 4 feet. Of the narrow gauges, the most prevalent, embracing 4,200 miles, is the meter, 3 feet 3⅜ inches. The Ceylon railways have the standard Indian gauge. The Russian Trans-Caspian lines have the Russian standard gauge of 5 feet. In Asia Minor, the line Mudania Brussa has a gauge of 3 feet 7½ inches. The island of Java has 449 miles of 3 foot 6 inch gauge, and 126 miles with 4-foot 8½-inch.

In Japan, with the exception of an 8-mile piece, begun in 1885, with a gauge of 2 feet 9 inches, all the roads have a 3-foot 6-inch gauge.

In Africa, the Egyptian railroads, amounting to 932 miles, are of the 4 feet 8½ inch gauge. Algiers and Tunis, with 1,203 miles in 1884, had the 4 foot 8½-inch standard

on all except 155 miles, which had a 3-foot 7½-inch gauge. The English Cape Colony had in 1885 1,522 miles, all of 3-foot 6-inch gauge.

In America, apart from the comparatively small mileage of the United States roads with 3-foot gauge, practically the whole of the United States and Canadian railways are of 4 feet 8½ inches to 4 feet 9 inches. In Mexico, in 1884, 2,083 miles were 4 feet 8½ inches, and 944 3-feet gauge. In Brazil, at the end of 1884, there were 869 miles of 5 feet 3 inches gauge, and 4,164 miles of various gauges between 2 feet and 4 feet 7 inches over 3,700 miles, being 1 meter, or 3 feet 3⅜ inches. So that this may be considered the standard gauge of Brazil.

In Australia the different colonies, rather singularly, have different gauges, that of New South Wales being 4 feet 8½ inches; Victoria, 5 feet 3 inches; South Australia, 5 feet 3 inches and 3 feet 6 inches, and the other colonies 3 feet 6 inches.

The total mileage in operation in the world at the end of 1885 was 303,048 miles. Of this length 74 per cent. were of the 4 feet 8½ inches to 4 feet 9 inches; 12 per cent. had larger gauges, and 14 per cent. smaller. (Engineering News, December 8, 1888.)

METAL RAILWAY TIES.

A point of great importance is the material of the ties, which should possess hardness, stiffness, and durability. In Central and South America the climate causes wood to deteriorate very rapidly, and again in certain parts of these countries it will probably be difficult to get suitable wood. One writer states that in Guatemala ants ate the wooden ties very rapidly. The usefulness of metal ties is appreciated already by the railway builders in Mexico and South America, as the following article from the Engineering News will show:

METAL RAILWAY TIES.

The following is the substance of a preliminary report made to the Department of Agriculture in February, 1889, by Mr. E. E. Russell Tratman, giving the present extent of use of iron ties throughout the world. It gives in concise form very complete information on this subject.

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SOUTH AMERICA.

Argentine Republic.—In this State, cast-iron pot ties are used almost exclusively, except in the far west and north. The Buenos Ayres Great Southern Railway, which began operations in 1865, has 13¾ miles of double track and 819½ miles of single track laid with cast-iron ties of an improved design. They are adopted on account of the difficulty of procuring good hard-wood ties in sufficient quantity and the greater expense of these wooden ties, also because they give a more rigid and satisfactory track. The Central Argentine Railway has 246 miles laid with cast-iron track. The Santa Fé and Cordoba Railway ordered 20,000 steel ties in England in 1888.

Chili.—Steel ties have been tried to a small extent, but the type was considered too heavy and expensive. Previous to the award in November last, to an American syndicate, of the contract for building about 780 miles of railway for the State, proposals had been invited by the Chilian legation in France for the supply of 739,400 metal ties 9 feet long and 725,100 ties 4½ feet long.

United States of Colombia.—There has been some talk of adopting metal ties on the Bolivar Railway.

MEXICO.

The Mexican Railway (Vera Cruz line) is using a large number of steel ties of the type in general use in India, and has obtained very good results with them, especially at times when the road has been flooded. These ties were first used in 1884, and at the end of June, 1888, there were 46½ miles of track laid with steel ties. The Mexican Central Railway has been contemplating the adoption of the same type of tie on the mountain division of the road, the advantages being that they last longer than wooden ties and keep the track in perfect gauge.

As a fact of interest I have extracted from a table in Engineering News the following:

On the Pennsylvania Railroad, in 1887, the average tons in loads of freight trains was 207; the average charge for transporting 1 ton 1 mile was .67 of a cent; the percentage of operating expenses to earnings was 63; the percentage of traffic expenses (coaching and merchandiso) to total operating expenses was 35; the average cost of transporting 1 ton 1 mile was .426 of a cent; the average cost of transporting 1 ton 1 mile, deducting all "traffic expenses" (coaching and merchandise) on all roads, .277 of a cent; average cost of train mile, freight and passenger, was 85.37 cents.

Table showing the Railways of Mexico, Central and South America, with their length, gauges, etc.

ARGENTINE REPUBLIC.

Name of railway.	From—	To—	Length.	Projected to—	Length.	Gauge.
			Miles.		*Miles.*	
Andine Railway	Villa Maria	San Juan	480			5 feet 6 inches.
Buenos Ayres and Valparaiso Transandine Railway Company.	Mendoza.			Chilian boundary	121	Do.
Argentine Northeastern	Monte Caseros		89	Corrientes	140	
	do			Posados	233.7	
Bahia Blanca and Northwestern	Bahia Blanca			Villa Mercedes	738	
Buenos Ayres and Ensenada Port	Buenos Ayres	Ensenada	35			
Buenos Ayres Northern	do	San Fernando	20			
Buenos Ayres Great Southern	do	Bahia Blanca	445.25			Do.
Branches, second track, etc			393.75			
Under construction					511	
Buenos Ayres and Pacific	Mercedes	Villa Mercedes	371.4			Do.
	do	Buenos Ayres	54.6			
Buenos Ayres and Rosario	Buenos Ayres	Sunchales	341	Tucuman	385	Do.
Branches					110	
Central Argentine	Rosario	Cordoba	246.6			Do.
Branches under construction					167.5	
Cordoba and Northwestern	Cordoba			Cruz del Eje	100	
Cordoba Central	do			Western and Central Colonies Railway.	132	
East Argentine	Concordia	Monte Caseros	96			4 feet 8½ inches.
	Monte Caseros	Ceibo Creek	3			
Entre Rios Central	Parana	Uruguay	186			
First Entre-Riano	Gualeguachu	Puerto Echague	6.2			Do.
Mendoza and San Rafael	Mendoza			San Rafael	180	
National Central Northern	Cordoba	Tucuman	338.5	Bolivian frontier	400	1 meter.
Branches	Frias	S. del Estero	100.4			
	Recreo	Chumbricha	109.1			
Northern Colonies Railway of Santa Fé	Santa Fé	Lehman	62	(Extension)	100.75	
Branches	San Carlos	Santa Fé				
	Santa Fé	Colastine				
Northwest Argentino	La Madrid	Santa Ana	30	Tucumen		
San Cristobal and Tucuman			10			
Santa Fé and Cordoba Great Southern	Villa Constitucion			Venado Tuerto	103	
	do			La Carlota	84	
Villa Maria and Rufino	Villa Maria			Rufino	140.5	
Western and Central Colonies of Santa Fé						
Lines in progress					337.9	

Western Railway of Buenos Ayres	Buenos Ayres	9 de Julio	162.4			5 feet 5 inches.
	Lujan	Junin	155.6			
Several branches			256.7			
Projected					102.96	
Western Railway of Santa Fé	Rosario	Candelaria	40	San José de la Esquina	70	
	Candelaria			Melinene	80	
Total			4,032.5			

BOLIVIA.

Antofagasta and Bolivian Railway Company	Ascotan	Uyuni	106.2	Oruro	198.5	Narrow.
	Uyuni			Potosi		
Arica and Tacua	Tacua (Chili)			La Paz		
Arequipo and Puno (Peru)	Desaguadero			do	93	
	La Paz			Oruro	155	
	Oruro			Cochabamba	124	
Central Northern (Argentine)	Frontier			Uyuni	300	
	Rio Paraguay			Santa Cruz	465	
	Santa Cruz			Sucre	465	
	Parana			Tarija	186	
	Santa Cruz			Rio Grande	93	
	Cochabamba			Rio Chimore	155	
	La Paz			Rio Beni	310	
Total			106.2			

BRAZIL.

Alagoas	Maceio	Imperatrix	5.5			1 meter.
Branch	Mainline			Assemblea	40	
Bahia and Minas	Carvellas	Aymores	88	Philadelphia	155.6	Do.
Bahia and San Francisco	Bahia	Alagoinhas	76.2			5 feet, 3 inches.
Timbo branch	Alagoinhas	Timbo	51.5			Do.
Bahia and San Francisco extension	do	Villa Novada Rainha.	199.6	Joazeiro	81.2	1 meter.
Brazilian Great Southern	Cuareim River	Itague	110			
Central Bahia	Sao Felix	Queimadinhas	170.4		1.9	3 feet, 6 inches.
Branch	Cachoeira	Ferra de S. Anna	15			Do.
Campos and Carangola	Campos	Porto Alegre	81	Santo dos Tombos	72.1	1 meter.
Patrocinio branch			24.2			
Itabopoano branch			13			
Companhia Bragantina	Campo Lempa	Braganza	32.2			Do.
Companhia Estrado de Ferro Macahé é Campos	Campos	Imbetiba	59.5			
Conde d'En	Parahyba	Independencia	60	Cabedello	11.2	Do.
Branch	Cobé Junction	Pilar	15	Inga		Do.
Do	Malungu			Alogoa Grande		Do.

Table showing the Railways of Mexico, Central and South America, with their length, gauges, etc.

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Name of railway.	From—	To—	Length.	Projected to—	Length.	Gauge.
			Miles.		*Miles.*	
Andine Railway	Villa Maria	San Juan	480			5 feet 6 inches.
Buenos Ayres and Valparaiso Transandine Railway Company.	Mendoza.			Chilian boundary	121	Do.
Argentine Northeastern	Monte Caseros		89	Corrientes	140	
	do			Posados	283.7	
Bahia Blanca and Northwestern	Bahia Blanca			Villa Mercedes	738	
Buenos Ayres and Ensenada Port	Buenos Ayres	Ensenada	35			
Buenos Ayres Northern	do	San Fernando	20			
Buenos Ayres Great Southern	do	Bahia Blanca	445.25			Do.
Branches, second track, etc			393.75			
Under construction					511	
Buenos Ayres and Pacific	Mercedes	Villa Mercedes	371.4			Do.
	do	Buenos Ayres	54.6			
Buenos Ayres and Rosario	Buenos Ayres	Sunchales	341	Tucuman	385	Do.
Branches					110	
Central Argentine	Rosario	Cordoba	246.6			Do.
Branches under construction					167.5	
Cordoba and Northwestern	Cordoba			Cruz del Eje	100	
Cordoba Central	do			Western and Central Colonies Railway.	132	
East Argentine	Concordia	Monte Caseros	96			4 feet 8½ inches.
	Monte Caseros	Celbo Creek	3			
Entre Rios Central	Parana	Uruguay	186			
First Entre-Riano	Gualeguachu	Puerto Echague	6.2			Do.
Mendoza and San Rafael	Mendoza			San Rafael	180	
National Central Northern	Cordoba	Tucuman	338.5	Bolivian frontier	400	1 meter.
Branches	Frias	S. del Estero	100.4			
	Recreo	Chumbricha	109.1			
Northern Colonies Railway of Santa Fé	Santa Fé	Lehman	62	(Extension)	100.75	
Branches	San Carlos	Santa Fé				
	Santa Fé	Colastine				
Northwest Argentino	La Madrid	Santa Ana	30	Tucumen		
San Cristobal and Tucuman			10			
Santa Fé and Cordoba Great Southern	Villa Constitucion			Venado Tuerto	103	
	do			La Carlota	84	
Villa Maria and Rufino	Villa Maria			Rufino	140.5	
Western and Central Colonies of Santa Fé						
Lines in progress					337.9	

Western Railway of Buenos Ayres	Buenos Ayres	9 de Julio	162.4			5 feet 5 inches.
	Lujan	Junin	155.6			
Several branches			256.7			
Projected					102.96	
Western Railway of Santa Fé	Rosario	Candelaria	40	San José de la Esquina	70	
	Candelaria			Melinene	80	
Total			4,032.5			

BOLIVIA.

Antofagasta and Bolivian Railway Company	Ascotan	Uyuni	106.2	Oruro	198.5	Narrow.
	Uyuni			Potosi		
Arica and Tacua	Tacua (Chili)			La Paz		
Arequipo and Puno (Peru)	Desaguadero			do	93	
	La Paz			Oruro	155	
	Oruro			Cochabamba	124	
Central Northern (Argentine)	Frontier			Uyuni	300	
	Rio Paraguay			Santa Cruz	465	
	Santa Cruz			Sucre	465	
	Parana			Tarija	186	
	Santa Cruz			Rio Grande	93	
	Cochabamba			Rio Chimore	155	
	La Paz			Rio Beni	310	
Total			106.2			

BRAZIL.

Alagoas	Maceio	Imperatrix	5.5			1 meter.
Branch	Mainline			Assemblea	40	
Bahia and Minas	Carvellas	Aymores	88	Philadelphia	155.6	Do.
Bahia and San Francisco	Bahia	Alagoinhas	76.2			5 feet, 3 inches.
Timbo branch	Alagoinhas	Timbo	51.5			Do.
Bahia and San Francisco extension	do	Villa Nova da Rainha.	199.6	Joazeiro	81.2	1 meter.
Brazilian Great Southern	Cuareim River	Itague	110			
Central Bahia	Sao Felix	Queimadinhas	170.4		1.9	3 feet, 6 inches.
Branch	Cachoeira	Ferra de S. Anna	15			Do.
Campos and Carangola	Campos	Porto Alegre	81	Santo dos Tombos	72.1	1 meter.
Patrocinio branch			24.2			
Itaboposano branch			13			
Companhia Bragantina	Campo Lempa	Braganza	32.2			Do.
Companhia Estrado de Ferro Macahe é Campos	Campos	Imbetiba	59.5			
Conde d'En	Parahyba	Independencia	60	Cabedello	11.2	Do.
Branch	Cobé Junction	Pilar	15	Inga		Do.
Do	Malungu			Alogoa Grande		Do.

Table showing the Railways of Mexico, Central and South America, with their length, gauges, etc.—Continued.

BRAZIL—Continued.

Name of railway.	From—	To—	Length.	Projected to—	Length.	Gauge.
			Miles.		*Miles.*	
Corcovada	Larangeiras	Mount Corcovada	2.5			
Dom Pedro Segundo	Rio de Janeiro	Surrounding Provinces.	440.0			5 feet 3 inches.
Extensions under construction					94.2	
Donna Theresa Christina	Laguna	Imbetuba	71.9			1 meter
Estrada de Ferro Baturite	Fortaleza	Canao				Do
Including branches			68.6			Do
Estrada de Ferro de Cantagallo	Nictheroy	Rio Macuco				1. 1meter.
		Passageme				Do.
Total with branches			165			
Great Western of Brazil	Recife	Limoeiro	60			3 feet 3⅜ inches.
Branch	Nazareth	Timbauba			28.5	Do.
Imperial Brazilian Natal and Nova Cruz Railway Company	Natal	Nova Cruz	75			Do.
Ituana	Jundiahy	Piracicaba	122.4	San Manoel	62.9	1 meter.
Branch		Itu	14			
Leopoldina	Porto Nova de Cunha	Northwest				Do.
Total with branches			184.1			Do.
Extensions and branches projected					40.3	Do.
Madera and Mamoré				Around Falls	204.6	
Minas Central of Brazil	Pitangui			Dom Pedro II railroad	150	
Minas and Rio	Cruzeiro	Tres Coracoes	105.4			Do.
Mogyanna	Campinas	Casa Branca	173			Do.
Branches			168.6			
Under construction					116.5	
Para and Bragança	Belem	Apehu	36.6	Braganca	93	Narrow.
Paranagua and Curatiba	Paranagua	Morretes	68.8			1 meter.
Paulista	Jundiahy	Belem do Descalvados.	125			5 feet 3 inches.
Branch	Condeiras	Pinhal	26			Do.
Paula Affonso	Piranhas	Jatoba	71.9			1 meter.
Porto Alegre and New Hamburgo	Porto Alegre	New Hamburgo	26.7			Do.
Recife and Carnaru	Recife		47.1	Carnaru	21.7	Do.
Recife and Sao Francisco Pernambuco	do	Palmares	77.5			5 feet 3 inches.
Recife and Sao Francisco Pernambuco	Una	Garanhuns	90.5		310	1 meter.
Rio de Janeiro and Northern	Manua	Petropolis	57	Entre Rios		
Rio de Ouro	Quinta do Caja	Rio de Ouro	30			Do.
Branches			10.4			Do.
San Paulo Brazilian	Santos	Jundiahy	86.2			5 feet 3 inches.
San Paulo and Rio Janeiro	San Paulo	Cachoeira	143.8			1 meter.
Santo Amoro	Santo Amoro	Jacu	22.3			Do.

Santo Antonio de Padua	Lucca	Miracema	57.6			2 feet 11½ inches.
San Carlos de Pinhal			163.7			
Sobral	Camocim	Sobral	80.0	Ipu	61.2	
Sorocabana	San Paulo	Tiete	137.6		95.5	1 meter.
Estrada de Ferro do Rio Grande á Bagé	Rio Grande	Bagé	173.6	Cacequi	130.2	1 meter.
Taquary and Uruguayana	Taquary	Santa Maria	162.4	Uruguayana	236.2	Do.
Unaio Valenciano	Desengano	Rio Preto	39.0			1.1 meter.
Itapemerim Alegre			43.4		129.0	
Sta Izabal do Rio Preto			45.9			
San Fedelis (under construction)					47.1	
Oeste de Minas			125.2		98.6	1 meter.
Juiz de Fora and Pion			32.2		5.5	
Banalense			7.4		10.5	Do.
Campos and St. Sebastian			11.1			.95 meter.
Rio das Floras			22.3			1 meter.
Barão Araruama			24.8			3 feet 1½ inches.
Rezende and Areias			17.4		40.3	1 meter.
Rio Pardo (Minas Geraes)			22.3			
Victoria Natividade					125.2	
Araraquara Rio Grande					329.2	
Other lines			174.6		288.7	
Total			4,961.4			

CHILI.

Lines owned by the State	Santiago	Valparaiso	115.9			1.67 meters.
	do	Curico	114.7			
	Curico	Chillan	130.8			
	Chillan	Talcahuano	116.2			
	Andes Branch		27.9			
	Palmilla Branch		24.2			
	San Rosendo	Angol	45.3			
	Angol	Traiguen	44.6			
	Santa Fé	Los Angeles	13.6			
	Renaica	Fort Victoria	46.5			
	Robleria	Collipulli	26.0			
	Chanaral	Salado	37.2			
Lines owned by individuals or companies:						
Anglo Chilian Nitrate and Railway Company	Tocapilla			Nitrate Grounds	60.0	
Antofagasta and Bolivia Railway Company	Antofagasta	Ascotan	272.8			
Arica and Tacna	Arica	Tacna	39.0			
Antofagasta Nitrate and Railway Company	Antofagasta			Chonchi	135.0	2 feet 6 inches.
Antofagasta and Aguas Blancas	do			Aguas Blancas		1 meter.
Carrizal and Cerro Blanco	Carrizal	Yuerba Buena				4 feet 2 inches.
Total with branches			50.2			
Copiapo	Caldera	San Antonio	93.6			4 feet 8½ inches.
	Pabellon	Charnacillo	24.8			
	Paipote	Puquios	31.6			

Table showing the Railways of Mexico, Central and South America, with their length, gauges, etc.—Continued.

CHILI—Continued.

Name of railway.	From—	To—	Length.	Projected to—	Length.	Gauge.
			Miles.		*Miles.*	
Coquimbo	Coquimbo	La Serena	9.3			
do	Ovalle and branch		76.3			5 feet 6 inches.
Elqui	Serena	Elqui	48.4			1 meter.
Laraquete and Moquegua	Laraquete	Moquegua	24.8			
Mejillones and Cerro Gordo	Mejillones	Cerro Gordo	18.0			
Patillos	Patillos	Salibreras	57.7	Lagunas	10.5	2 feet 6 inches.
Pisaqua	Pisaqua	Tres Marias	54.8			Do.
Branches and sidings			10.9			
Iquique	Iquique	Tres Marias	67.7			Do.
Branches, etc			52.6			
Taltal	Taltal	El Refresco	47.8	Arturo Prot		
Sidings			3.0			
Tongoy	Tongoy	Tamaya	34.1	Ovalle	20.5	3 feet 6 inches.
North and South American Construction Company.	Huasco			Vallenar	31.0	1 meter.
	Ovalle			San Marcos	37.2	Do.
	Vilas			Salamanca	70.4	Do.
	Santiago			Melipilla	36.6	Do.
	Palmilla			Alcones	27.9	Do.
	Talca			Constitusion	52.7	Do.
	Pelequen			Ponmo	21.7	Do.
	Colhue			Mulchen	26.7	Do.
	Victoria			Osorno	249.9	Do.
	La Calera			Cabildo	47.1	Do.
Total of all			1,759.9		610.2	

COLOMBIA.

Panama Railway	Colon	Panama	47			5 feet.
Bolivar	Baranquilla	Pto Belillo	20			3 feet 6 inches.
Cucuta	Cucuta	Vilbimazar	34			3 feet 3½ inches.
La Dorado	Hondo	Yeguas	18	Conejo	12	3 feet.
Girardot	Girardot	Tocaima	20	Bogota	76	Do.
Antioquia	Puerto Berrio	Pavia	30	Medellin	95	Do.
Cauca	Buenaventura		12	Cali	65	Do.
Santa Marta	Santa Marta	Cienega	20	Banco		
Santander	Puerto Wilchio		1	Bucuramanga	75	
Savanna	Facatativa	Bogota	24			
Total			226			

COSTA RICA.

Atlantic Railway	Punta Limon	Carrillo	70.			
	Punta Arenas	Esparta	14.	Alajuela (or San José)	50.	
Central Railway	Alajuela	Cartago	26.5	A junction with first section	74.5	
	Jimenez			San Juan River	90.	
	Esparta			Nicaragua boundary		
Total			110.5			

ECUADOR.

Yuaguachi	Yuaguachi	Chimbo	40.	Sibambe	49.	
(Southern Railway)	Duran			Yuaguachi	14.	
	Sibambe			Quito		
Ibarra and San Lorenzo	Ibarra			San Lorenzo		
Bahia de Caraquiz and Quito ("La Compañia del Perrocarril de Quito y el Pacifico.")	Bahia			Quito		
Machala and Cuenca	Machala			Cuenca		
Baba and Vinces	Baba			Vinces		
	....do			Pueblovicjo		
Total			40.			

GUATEMALA.

Champerico and Northern Railroad	Champerico	Retalhuleu	27.25	San Felipe	43.25	3 feet.
Ferro Carril del Norte de Guatemala	Santo Tomas		4.	Guatemala City	185.	
Guatemala Central Railroad	San José	Guatemala City	71.8			1 meter.
Branch				La Antigua		
	Guatemala City			Mexican boundary		
Total			103.05			

HONDURAS.

Honduras Central Railroad	Truxillo			Jutecalpa and the Bay of Fonseca	200.	
Honduras North Coast Railway and Improvement Company.	....do			Puerto Cortes and Guatemala boundary.	150.	3 feet.
Honduras Railway (operated only to St. Iago, 37 miles).	Puerto Cortes	San Pedro Sula	69.	Bay of Fonseca	200.	
Truxillo and Roman River Railroad	Truxillo			Roman River and up Arenal Valley.	20.	
Total			69.			

Table showing the Railways of Mexico, Central and South America, with their length, gauges, etc.—Continued.

MEXICO.

Name of railway.	From—	To—	Length.	Projected to—	Length.	Gauge.
			Miles.		*Miles.*	
Sonora	Nogales	Guaymas	262.41			4 feet 8½ inches.
Mexican Central	El Paso	City of Mexico	1,224.0			Do.
Branches, etc			444.0			Do.
Mexican National	Laredo	City of Mexico	838.6			3 feet.
Branches, etc			393.6			Do.
Mexican International	Piedras Negras	Torreon	383.4			4 feet 8½ inches.
Branches, etc			12.3			Do.
Mexican Southern	Laredo			Guatemala frontier		
Built	City of Mexico	Puebla				
Mexican Railway	Vera Cruz	City of Mexico	264.0			
Jalapa Branch	do	Jalapa	70.75			
Branch	Apizaco	Puebla	29.			
Interoceanic	Vera Cruz			Acapulco	580.	3 feet.
Total built and owned by this company			339.9			Do.
Part of main line	Mexico City	Perote	160.			
Sinaloa and Durango	Altata	Culiacan	38.5			4 feet 8½ inches.
	Mazatlan			Guaymas		
Texas, Topolobampo and Pacific	Eagle Pass			Topolobampo		
Branches				Presidio del Norte		
Total length, about 1,500 miles				Alamos		
				Mazatlan		
Tehuantepec	Minatitlan		78.6	Salina Cruz	91.4	
Cardenas	Villa de Cardenas		4.0	El Ingenio		
Ferro-carril de Hidalgo	Irolo	Pachuca	37.			3 feet.
Branches			26.			
Ferro-carril de Monterey y Golfo	Monterey		78.2	Tampico	321.8	
Ferro-carril Nacional de Tehuacan á Esperanza	Tehuacan	Esperanza	31.0		49.6	4 feet 8½ inches.
Michoacan & Pacific	Maravatio	Angangeo	27.9	Iguala		
Nautla & San Marcos	Nautla		4.0	San Marcos	111.0	
Puebla and Izucar de Matamoros	Puebla	Izucar	37.0			Narrow.
Vera Cruz, Anton Lizardo and Alvarado	Vera Cruz	Alvarado	34.0	Isthmus of Tehuantepec	84.	
Yucatan Railways:						
Ferro-carril de Merida á Progreso	Merida	Progreso	24.0			4 feet 9 inches.
Soluta branch	do	Soluta	30.0			
Ferro-carril de Merida á Peto	do	Tiscal	43.4	Peto	56.6	3 feet.
Ferro-carril de Merida á Calkini	do	Chochola	21.0	Calkini	81.0	Do.
Ferro-carril de Campeche á Calkini	Campeche			do	52.	Do.
Branches	do	Pomuch	39.0			Do.
Do	do	Lerma	6.			Do.
Ferro-carril de Merida á Valladolid	Merida	Motul	22.	Valladolid	84.	Do.
Branch	Conkal	Progreso	19.			Do.

Do	Cenotilla			Tizimin	34.7	Do.
Concessions	Cancel			Progreso		
	Izamal			Chan Santa Cruz		
	Tekanto			Izamal		
Total			5,021.66			

NICARAUGUA.

Nicaragua Railway	Corinto	Momotombo	58			3 feet 6 inches.
	Managua	Granada	32			Do.
San Juan San Jorge	San Juan			San Jorge		
Chinandega	Chinandega			El Viejo	19	
Matagalpa and Lake Managua	Matagalpa			Lake Managua		
Matagalpa and East Coast	Matagalpa			Mouth of Ramos River	90	
Total			90			

PARAGUAY.

Ferro-carril Nacional	Asuncion	Villa Rica	92.0	Encarnacion	136	5 feet 6 inches.
Transcontinental Railway	do			Santos in Brazil	806	
Total			92.0			

PERU.

Payta and Piura	Paita	Pinra	63.0	Limon		4 feet 8½ inches.
Pimentel	Pimentel	Chiclayo	30.0		15.0	Narrow.
Eten and Ferrañafe	Eten	Ferrañafe	50.0			4 feet 8½ inches.
Pacasmayo and Magdalena	Pacasmayo	Yonan	93.0	Cajamarca		Do.
Salaverry and Trujillo	Salaverry	Trujillo	85.0	Coal mines		3 feet.
Chimbote and Requay	Chimbote	Requay	60.0		112.0	Do.
Lima, Ancon and Chancay	Lima	Chancay	43.0	Huacho	25.0	1 meter.
Lima and Magdalena	do	Magdalena	5.0			Do.
Callao, Lima and Oroya	Callao	Chicla	86.5	Oraya	49.3	4 feet 8½ inches.
Projected	Ororoya			Cerro de Pasco	36.0	Do.
Cerro de Pasco	Mines	Mill	9.0		22.0	
Lima Railways Company	Callao	Chorillos	17.5			Do.
Pisco and Ica	Pisco	Ica	46.0			Do.
Branch			1.0			Do.
Mollendo and Arequipa	Mollendo	Arequipa	107.0			Do.

Table showing the Railways of Mexico, Central and South America, with their length, gauges, etc.—Continued.

PERU—Continued.

Name of railway.	From—	To—	Length.	Projected to—	Length.	Gauge.
			Miles.		*Miles.*	
Arequipa, Puno and Cuzco	Arequipa	Puno	217.6			4 feet 8½ inches.
	Juliaca	Santa Rosa	82.0	Cuzco?		
Siding, etc			41.5			
Proposed by Government	Puno			Desaguadero		Narrow.
	Oroya Railway			Point on Amazon	180.0	Do.
	Chancay			Cerro de Pasco		
	Tacna			Puno		
	Trujillo			Cajamarca		
	..do			Eten		
Total			1,037.1			

SALVADOR.

Acajutla and Sonsonate Railroad	Acajutla	Sonsonate	21½	Amate Marin	80¾	3 feet.
San Salvador and Amate Marin	San Salvador			do	25	
La Union and San Miguel	La Union			San Miguel		
La Libertad and San Salvador	La Libertad			San Salvador		
Salvadore Central Railway	La Union			Guatemala		
Tramway	San Salvador	Sta Tecla	10½	Boundary line		
Total			32			

URUGUAY.

Central Uruguay	Montevideo	Rio Negro	170	Durazno		4 feet, 8½ inches.
Branch	Santa Lucia	San José	20	Hygueritas	126	
Central Uruguay, Northern Extension				Brazilian frontier	179	
Northeastern	Montevideo	Minas	74	Artigas		Do.
Northwestern	Salto	Brazilian frontier	111			
Branch	Isla de Cabello			San Eugenio	70	
Midland Uruguay	Paso de los Toros			Salto	174	
Northern Railway and Tramway	Montevideo	Santa Lucia	25			
Total			400			

VENEZUELA.

Caracas and La Guayra	Caracas	La Guayra	23			3 feet.
Marquetia and Macuto	Marquetia	Macuto	4.9			
Caracas and El Valle	Caracas	El Valle	3.1			
Puerto Cabello and Valencia	Puerto Cabello	Valencia	33.5			3 feet, 6 inches.
Tucacas	Tucacas	Mines of Aroa	55.8			2 feet.
La Ceiba and Mendoza	La Ceiba	Mendoza	21.7	Valera		
Barcelona	Barcelona	Guanta Bay	11.8			
Carenero	Carenero	San José	20.5			
Central Railroad	Caracas		12.4	Valencia	132.4	
Grand Trunk Line of Venezuela	do		9.3	San Carlos	176.7	
	La Luz			Barquisimeto, etc.	217.0	
	La Fria			San Cristobal		
La Luz and Barquisimeto	Merida			Lake Coast	161.2	
	Maracaibo			Cajoro	96.1	
	Orinoco			Yuruari	124.0	
Total			196			

BRITISH GUIANA.

Demerara Railway	Georgetown	Mahaica	20			
Total			20			

Table showing the Railways of Mexico, Central and South America, with their length, gauges, etc.—Continued.

BRAZIL—Continued.

Name of railway.	From—	To—	Length.	Projected to—	Length.	Gauge.
			Miles.		*Miles.*	
Corcovada	Larangeiras	Mount Corcovada	2.5			
Dom Pedro Segundo	Rio de Janeiro	Surrounding Provinces.	440.0			5 feet 3 inches.
Extensions under construction					94.2	
Donna Theresa Christina	Laguna	Imbetuba	71.9			1 meter
Estrada de Ferro Baturite	Fortaleza	Canao				Do
Including branches			68.6			Do
Estrada de Ferro de Cantagallo	Nictheroy	Rio Macuco				1. 1meter.
	.....	Passageme				Do.
Total with branches			165			
Great Western of Brazil	Recife	Limoeiro	60			3 feet 3⅜ inches.
Branch	Nazareth	Timbauba			28.5	Do.
Imperial Brazilian Natal and Nova Cruz Railway Company	Natal	Nova Cruz	75			Do.
Ituana	Jundiahy	Piracicaba	122.4	San Manoel	62.9	1 meter.
Branch		Itu	14			
Leopoldina	Porto Nova de Cunha	Northwest				Do.
Total with branches			184.1			Do.
Extensions and branches projected					40.3	Do.
Madera and Mamoré				Around Falls	204.6	
Minas Central of Brazil	Pitangui			Dom Pedro II railroad	150	
Minas and Rio	Cruzeiro	Tres Coracoes	105.4			Do.
Mogyanna	Campinas	Casa Branca	173			Do.
Branches			168.6			
Under construction					116.5	
Para and Bragança	Belem	Apehu	36.6	Braganca	93	Narrow.
Paranagua and Curatiba	Paranagua	Morretes	68.8			1 meter.
Paulista	Jundiahy	Belem do Descalvados.	125			5 feet 3 inches.
Branch	Condeiras	Pinhal	26			Do.
Paula Affonso	Piranhas	Jatoba	71.9			1 meter.
Porto Alegre and New Hamburgo	Porto Alegre	New Hamburgo	26.7			Do.
Recife and Caruaru	Recife		47.1	Caruaru	21.7	Do.
Recife and Sao Francisco Pernambuco	....do	Palmares	77.5			5 feet 3 inches.
Recife and Sao Francisco Pernambuco	Una	Garanhuns	90.5		310	1 meter.
Rio de Janeiro and Northern	Manua	Petropolis	57	Entre Rios		
Rio de Ouro	Quinta do Caja	Rio de Ouro	30			Do.
Branches			10.4			Do.
San Paulo Brazilian	Santos	Jundiahy	86.2			5 feet 3 inches.
San Paulo and Rio Janeiro	San Paulo	Cachoeira	143.8			1 meter.
Santo Amoro	Santo Amoro	Jacu	22.3			Do.

Santo Antonio de Padua	Lucca	Miracema	57.6			2 feet 11½ inches.
San Carlos de Pinhal			163.7			
Sobral	Camocim	Sobral	80.0	Ipu	61.2	
Sorocabana	San Paulo	Tiete	137.6		95.5	1 meter.
Estrada de Ferro do Rio Grande á Bagé	Rio Grande	Bagè	173.6	Cacequi	130.2	1 meter.
Taquary and Uruguayana	Taquary	Santa Maria	162.4	Uruguayana	236.2	Do.
Unaio Valenciano	Desengano	Rio Preto	39.0			1.1 meter.
Itapemerim Alegre			43.4		129.0	
Sta Izabal do Rio Preto			45.9			
San Fedelis (under construction)					47.1	
Oeste de Minas			125.2		98.6	1 meter.
Juiz de Fora and Pion			32.2		5.5	
Banalense			7.4		10.5	Do.
Campos and St. Sebastian			11.1			.95 meter.
Rio das Floras			22.3			1 meter.
Barão Araruama			24.8			3 feet 1½ inches.
Rezende and Areias			17.4		40.3	1 meter.
Rio Pardo (Minas Geraes)			22.3			
Victoria Natividade					125.2	
Araraquara Rio Grande					329.2	
Other lines			174.6		288.7	
Total			4,961.4			

CHILI.

Lines owned by the State	Santiago	Valparaiso	115.9			1.67 meters.
	do	Curico	114.7			
	Curico	Chillan	130.8			
	Chillan	Talcahuano	116.2			
	Andes Branch		27.9			
	Palmilla Branch		24.2			
	San Rosendo	Angol	45.3			
	Angol	Traiguen	44.6			
	Santa Fé	Los Angeles	13.6			
	Renaica	Fort Victoria	46.5			
	Robleria	Collipulli	26.0			
	Chanaral	Salado	37.2			
Lines owned by individuals or companies:						
Anglo Chilian Nitrate and Railway Company	Tocapilla			Nitrate Grounds	60.0	
Antofagasta and Bolivia Railway Company	Antofagasta	Ascotan	272.8			
Arica and Tacna	Arica	Tacna	39.0			
Antofagasta Nitrate and Railway Company	Antofagasta			Chonchi	135.0	2 feet 6 inches.
Antofagasta and Aguas Blancas	do			Aguas Blancas		1 meter.
Carrizal and Cerro Blanco	Carrizal	Yuerba Buena				4 feet 2 inches.
Total with branches			50.2			
Copiapo	Caldera	San Antonio	93.6			4 feet 8½ inches.
	Pabellon	Charnacillo	24.8			
	Paipote	Puquios	31.6			

Table showing the Railways of Mexico, Central and South America, with their length, gauges, etc.—Continued.

CHILI—Continued.

Name of railway.	From—	To—	Length.	Projected to—	Length.	Gauge.
			Miles.		*Miles.*	
Coquimbo	Coquimbo	La Serena	9.3			
	do	Ovalle and branch	76.3			5 feet 6 inches.
Elqui	Serena	Elqui	48.4			1 meter.
Laraquete and Moquegua	Laraquete	Moquegua	24.8			
Mejillones and Cerro Gordo	Mejillones	Cerro Gordo	18.0			
Patillos	Patillos	Salibreras	57.7	Lagunas	10.5	2 feet 6 inches.
Pisagua	Pisagua	Tres Marias	54.8			Do.
Branches and sidings			10.9			
Iquique	Iquique	Tres Marias	67.7			Do.
Branches, etc			52.6			
Taltal	Taltal	El Refresco	47.8	Arturo Prot		
Sidings			3.0			
Tongoy	Tongoy	Tamaya	34.1	Ovalle	20.5	3 feet 6 inches.
North and South American Construction Company.	Huasco			Vallenar	31.0	1 meter.
	Ovalle			San Marcos	37.2	Do.
	Vilas			Salamanca	70.4	Do.
	Santiago			Melipilla	36.6	Do.
	Palmilla			Alcones	27.9	Do.
	Talca			Constitusion	52.7	Do.
	Pelequen			Peumo	21.7	Do.
	Coihue			Mulchen	26.7	Do.
	Victoria			Osorno	249.9	Do.
	La Calera			Cabildo	47.1	Do.
Total of all			1,759.9		610.2	

COLOMBIA.

Panama Railway	Colon	Panama	47			5 feet.
Bolivar	Baranquilla	Pto Belillo	20			3 feet 6 inches.
Cucuta	Cucuta	Vilbimazar	34			3 feet 3½ inches.
La Dorado	Hondo	Yeguas	18	Conejo	12	3 feet.
Girardot	Girardot	Tocaima	20	Bogota	76	Do.
Antioquia	Puerto Berrio	Pavia	30	Medellin	95	Do.
Cauca	Buenaventura		12	Cali	65	Do.
Santa Marta	Santa Marta	Cienega	20	Banco		
Santander	Puerto Wilchio		1	Bucuramanga	75	
Savanna	Facatativa	Bogota	24			
Total			226			

COSTA RICA.

Atlantic Railway	Punta Limon	Carrillo	70.			
	Punta Arenas	Esparta	14.	Alajuela (or San José)	50.	
Central Railway	Alajuela	Cartago	26.5	A junction with first section	74.5	
	Jimenez			San Juan River	90.	
	Esparta			Nicaragua boundary		
Total			110.5			

ECUADOR.

Yuaguachi	Yuaguachi	Chimbo	40.	Sibambe	49.	
(Southern Railway)	Duran			Yuaguachi	14.	
	Sibambe			Quito		
Ibarra and San Lorenzo	Ibarra			San Lorenzo		
Bahia de Carequiz and Quito ("La Compañia del Perrocarril de Quito y el Pacifico.")	Bahia			Quito		
Machala and Cuenca	Machala			Cuenca		
Baba and Vinces	Baba			Vinces		
	...do			Pueblovicjo		
Total			40.			

GUATEMALA.

Champerico and Northern Railroad	Champerico	Retalhuleu	27.25	San Felipe	43.25	3 feet.
Ferro Carril del Norte de Guatemala	Santo Tomas		4.	Guatemala City	185.	
Guatemala Central Railroad	San José	Guatemala City	71.8			1 meter.
Branch				La Antigua		
	Guatemala City			Mexican boundary		
Total			103.05			

HONDURAS.

Honduras Central Railroad	Truxillo			Jutecalpa and the Bay of Fonseca	200.	
Honduras North Coast Railway and Improvement Company.	...do			Puerto Cortes and Guatemala boundary.	150.	3 feet.
Honduras Railway (operated only to St. Iago, 37 miles).	Puerto Cortes	San Pedro Sula	69.	Bay of Fonseca	200.	
Truxillo and Roman River Railroad	Truxillo			Roman River and up Arenal Valley.	20.	
Total			69.			

Table showing the Railways of Mexico, Central and South America, with their length, gauges, etc.—Continued.

MEXICO.

Name of railway.	From—	To—	Length.	Projected to—	Length.	Gauge.
			Miles.		*Miles.*	
Sonora	Nogales	Guaymas	262.41			4 feet 8½ inches.
Mexican Central	El Paso	City of Mexico	1,224.0			Do.
Branches, etc			444.0			Do.
Mexican National	Laredo	City of Mexico	838.6			3 feet.
Branches, etc			393.6			Do.
Mexican International	Piedras Negras	Torreon	383.4			4 feet 8½ inches.
Branches, etc			12.3			Do.
Mexican Southern	Laredo			Guatemala frontier		
Built	City of Mexico	Puebla.				
Mexican Railway	Vera Cruz	City of Mexico	264.0			
Jalapa Branch	do	Jalapa	70.75			
Branch	Apizaco	Puebla	29.			
Interoceanic	Vera Cruz			Acapulco	580.	3 feet.
Total built and owned by this company			339.9			Do.
Part of main line	Mexico City	Perote	160.			
Sinaloa and Durango	Altata	Culiacan	38.5			4 feet 8½ inches.
	Mazatlan			Guaymas		
Texas, Topolobampo and Pacific	Eagle Pass			Topolobampo		
Branches				Presidio del Norte		
Total length, about 1,500 miles				Alamos		
				Mazatlan		
Tehuantepec	Minatitlan		78.6	Salina Cruz	91.4	
Cardenas	Villa de Cardenas		4.0	El Ingenio		
Ferro-carril de Hidalgo	Irolo	Pachuca	37.			3 feet.
Branches			26.			
Ferro-carril de Monterey y Golfo	Monterey		78.2	Tampico	321.8	
Ferro-carril Nacional de Tehuacan á Esperanza	Tehuacan	Esperanza	31.0		49.6	4 feet 8½ inches.
Michoacan & Pacific	Maravatio	Angangeo	27.9	Ignala		
Nautla & San Marcos	Nautla		4.0	San Marcos	111.0	
Puebla and Izucar de Matamoros	Puebla	Izucar	37.0			Narrow.
Vera Cruz, Anton Lizardo and Alvarado	Vera Cruz	Alvarado	34.0	Isthmus of Tehuantepec	84.	
Yucatan Railways:						
Ferro-carril de Merida á Progreso	Merida	Progreso	24.0			4 feet 9 inches.
Soluta branch	do	Soluta	30.0			
Ferro-carril de Merida á Peto	do	Tiscal	43.4	Peto	56.6	3 feet.
Ferro-carril de Merida á Calkini	do	Chochola	21.0	Calkini	81.0	Do.
Ferro-carril de Campeche á Calkini	Campeche			do	52.	Do.
Branches	do	Pomuch	39.0			Do.
Do	do	Lerma	6.			Do.
Ferro-carril de Merida á Valladolid	Merida	Motul	22.	Valladolid	84.	Do.
Branch	Conkal	Progreso	19.			Do.

Do	Cenotilla			Tizimin	34.7	Do.
Concessions	Cancel			Progreso		
	Izamal			Chan Santa Cruz		
	Tekanto			Izamal		
Total			5,021.66			

NICARAUGUA.

Nicaragua Railway	Corinto	Momotombo	58			3 feet 6 inches.
	Managua	Granada	32			Do.
San Juan San Jorge	San Juan			San Jorge		
Chinandega	Chinandega			El Viejo	19	
Matagalpa and Lake Managua	Matagalpa			Lake Managua		
Matagalpa and East Coast	Matagalpa			Mouth of Ramos River	90	
Total			90			

PARAGUAY.

Ferro-carril Nacional	Asuncion	Villa Rica	92.0	Encarnacion	136	5 feet 6 inches.
Transcontinental Railway	do			Santos in Brazil	806	
Total			92.0			

PERU.

Payta and Piura	Paita	Piura	63.0	Limon		4 feet 8½ inches.
Pimentel	Pimentel	Chiclayo	30.0		15.0	Narrow.
Eten and Ferrañafe	Eten	Ferrañafe	50.0			4 feet 8½ inches.
Pacasmayo and Magdalena	Pacasmayo	Yonan	93.0	Cajamarca		Do.
Salaverry and Trujillo	Salaverry	Trujillo	85.0	Coal mines		3 feet.
Chimbote and Requay	Chimbote	Requay	60.0		112.0	Do.
Lima, Ancon and Chancay	Lima	Chancay	43.0	Huacho	25.0	1 meter.
Lima and Magdalena	do	Magdalena	5.0			Do.
Callao, Lima and Oroya	Callao	Chicla	86.5	Oraya	49.3	4 feet 8½ inches.
Projected	Ororoya			Cerro de Pasco	36.0	Do.
Cerro de Pasco	Mines	Mill	9.0		22.0	
Lima Railways Company	Callao	Chorillos	17.5			Do.
Pisco and Ica	Pisco	Ica	46.0			Do.
Branch			1.0			Do.
Mollendo and Arequipa	Mollendo	Arequipa	107.0			Do.

Table showing the Railways of Mexico, Central and South America, with their length, gauges, etc.—Continued.

PERU—Continued.

Name of railway.	From—	To—	Length.	Projected to—	Length.	Gauge.
			Miles.		*Miles.*	
Arequipa, Puno and Cuzco	Arequipa	Puno	217.6			4 feet 8½ inches.
	Juliaca	Santa Rosa	82.0	Cuzco?		
Siding, etc			41.5			
Proposed by Government	Puno			Desaguadero		Narrow.
	Oroya Railway			Point on Amazon	180.0	Do.
	Chancay			Cerro de Pasco		
	Tacna			Puno		
	Trujillo			Cajamarca		
	..do			Eten		
Total			1,037.1			

SALVADOR.

Acajutla and Sonsonate Railroad	Acajutla	Sonsonate	21½	Amate Marin	80½	3 feet.
San Salvador and Amate Marin	San Salvador			do	25	
La Union and San Miguel	La Union			San Miguel		
La Libertad and San Salvador	La Libertad			San Salvador		
Salvadore Central Railway	La Union			Guatemala		
Tramway	San Salvador	Sta Tecla	10½	Boundary line		
Total			32			

URUGUAY.

Central Uruguay	Montevideo	Rio Negro	170	Durazno		4 feet, 8½ inches.
Branch	Santa Lucia	San José	20	Hygueritas	126	
Central Uruguay, Northern Extension				Brazilian frontier	179	
Northeastern	Montevideo	Minas	74	Artigas		Do.
Northwestern	Salto	Brazilian frontier	111			
Branch	Isla de Cabello			San Eugenio	70	
Midland Uruguay	Paso de los Toros			Salto	174	
Northern Railway and Tramway	Montevideo	Santa Lucia	25			
Total			400			

VENEZUELA.

Caracas and La Guayra	Caracas	La Guayra	23			3 feet.
Marquetia and Macuto	Marquetia	Macuto	4.9			
Caracas and El Valle	Caracas	El Valle	3.1			
Puerto Cabello and Valencia	Puerto Cabello	Valencia	33.5			3 feet, 6 inches.
Tucacas	Tucacas	Mines of Aroa	55.8			2 feet.
La Ceiba and Mendoza	La Ceiba	Mendoza	21.7	Valera		
Barcelona	Barcelona	Guanta Bay	11.8			
Carenero	Carenero	San José	20.5			
Central Railroad	Caracas		12.4	Valencia	132.4	
Grand Trunk Line of Venezuela	do		9.3	San Carlos	176.7	
La Luz and Barquisimeto	La Luz			Barquisimeto, etc.	217.0	
	La Fria			San Cristobal		
	Merida			Lake Coast	161.2	
	Maracaibo			Cajoro	96.1	
	Orinoco			Yuruari	124.0	
Total			196			

BRITISH GUIANA.

Demerara Railway	Georgetown	Mahaica	20			
Total			20			

CERTAIN HEIGHTS DETERMINED BY THE FRENCH EXPEDITION.

Locality.	Height.	Locality.	Height.
	Feet.		*Feet.*
Tactic	4,725	Copan	1,830
Coban	4,356	Vado Hondo	1,237
San Cristobal	4,643	Chiquimula	1,244
San Miguel Uspantan	6,040	Zacapa	449
Cunen	5,942	Pacaya	8,366
Sacapulas	3,826	Volcan de Agua	12,313
Santa Cruz del Guiche	6,621	Volcan de Agua (Santa Maria)	6,828
Quezaltenango	7,697	Volcan de Agua (Crater bottom)	12,087
Totonicapan	8,150	Volcan de Fuego	13,127
Sololá	7,041	Volcan de Fuego (la Meseta)	12,001
Guatemala City	5,013	Acatenango	13,616
Antigua	5,072	Volcan de Atitlan	11,723
Ciudad Vieja	5,151	Cerro de Atitlan	11,723
Escuintla	1,450	Cerro Quemado	10,201
Amatitlan	3,901	Santa Maria	11,453
Palin	3,753	Lago de Atitlan	5,112
Cuajiniquilapa	2,848	Lago de Amatitlan	3,918
Cerro Redondo	3,542	Lago de San Cristobal	4,643
Los Esclavos	2,394	Lago de Ayarza	3,100
Agua Blanca	2 658	Jalpatagua	1,904
Suchitan	4,108	Rio Paz	908
Santa Catarina (Rio)	2,251	Apaneca	4,864
Retalhuleu	775	Ahuachapan	907
Salama	2,874	Sonsonate	650
Col de Pinula	6,300	Santa Tecla	2,980
Tray Janes	5,537	San Salvador	2,201
Lac de los Pinos	3,274	Cojutepeque	2,940
Santa Caterina (Pueblo)	2,325	San Vicente	1,175
Esquipulas	2,986	Rio Lempa (Barca)	10
Paso del Rodeo	2,744	Chinameca	2,000
Los Horcones	3,637	San Miguel	363
Piedra de Amolas	2,340	La Union	66

HEIGHTS IN NICARAGUA.

Lake Nicaragua	110	Lake Managua	148

HEIGHTS IN COSTA RICA.

San Jose	3,868	Atenas	2,380
Cartago	4,930	San Mateo	1,050
Heredia	3,786	Esparta	718
Alajuela	3,001		

HEIGHTS IN SOUTH AMERICA.

Medellin	5,085	San Rafael	8,764
Antioquia	1,888	Huanuco	6,300
Cartago	3,197	Juliaca	13,025
Buga	3,281	Puno	12,962
Cauca at Buga	2,957	La Paz	12,226
Popayan	5,810	Potosi	13,330
Purace	8,732	Quaranda	8,840
Tuquerres	9,968	Arenal	14,250
Bogota	8,725	Ambato	8,490
Piedras	775	Tacunga	9,181
Tocaima	1,806	Tinpullo	11,662
Ibagué	4,475	Panecilla	10,101
Palmilla	6,864	Riobamba	9,200
Gallegos	8,775	Tablon	10,516
Balsa	4,620	Papallacta	10,511
Honda	719	Baeza	6,625
Paramo of Quindio	11,496	Archidona	2,115
Neyva	2,511	Napo	1,450
La Plata	4,227	Mouth of Napo	385
Cali	3,537	Coca	850
Cauca at Cali	3,278	Mouth Aguarico	586
Las Papas	14,272	Moyobamba	1,043
Point near Pasto	6,488	Chachapoyas	7,682
Ibarra	7,500	Tinga Maria	2,200
Quito	9,520	Negro and Cassiquiari	400
Cuenca	8,640	Mouth Mamore	800
Jaen	1,491	Tabatinga	255
Loja	6,768	Nauta	436
Cerro de Pasco	13,673	Mouth Ucayali	376
Tarma	10,075	Iquitos	350
Cuzco	11,445	Cajamarca	9,438

GREATEST HEIGHTS FOUND ON CANAL SURVEYS.

Tehauntepec, 780 feet, by Barnard's map.

Nicaragua Canal, 156; summit is 46 feet above Lake Nicaragua.

From Baily's map of Nicaragua, on which there are laid down several lines for canals, the following heights are obtained: Sapoa trial line, 258 feet; Brito line, 202 feet, Managua Realejo line, 212 feet; Lake Managua to Gulf of Fonseca probably 55 feet above the lake.

Panama: Garella's line, 459.2 feet, via Rio Gigante, Rio Grande, Rio Chagres.

Panama Railroad: Colonel Hughes, in Admiral Davis's report, 239 feet.

Darien: Savari and Morti Rivers, by Gisborne, 1854, 1,020 feet.

Darien, via Atrato, Turando, Michler, 900 feet.

Honduras Interoceanic Railroad, in Squier's book of same name, via Rancho, Chiquita Pass, 2,408 feet; Guajoca, 2,308 feet; Tambla, 1,944 feet; Lamani, 2,016 feet; Nicaragua, Pim, and Leeman, via river Tule and Rama, highest, 700 feet. This is east of Nicaragua.

TABLE OF DISTANCES.

FROM POINTS IN THE UNITED STATES TO POINTS IN MEXICO.

	Miles.
New York to St. Louis	1,065
New York to New Orleans	1,338
St. Louis to El Paso	1,359
St. Louis to Eagle Pass	1,098
St. Louis to Laredo	1,196
St. Louis to New Orleans	700
New Orleans to El Paso	1,158
New Orleans to Eagle Pass	745
New Orleans to Laredo	731
New York, via St. Louis, to El Paso	2,424
New York, via St. Louis, to Eagle Pass	2,163
New York, via St. Louis, to Laredo	2,261
New York, via New Orleans, to El Paso	2,496
New York, via New Orleans, to Eagle Pass	2,083
New York, via New Orleans, to Laredo	2,069
San Francisco to El Paso, via Southern Pacific	1,286
El Paso to City of Mexico	1,224
Eagle Pass to City of Mexico	1,091
Laredo to City of Mexico	839
Eagle Pass to Torreon	384
New York, via St. Louis and El Paso, to City of Mexico	3,648
New York, via St. Louis and Eagle Pass, to City of Mexico	3,254
New York, via St. Louis and Laredo, to City of Mexico	3,100
New York, via New Orleans and El Paso, to City of Mexico	3,720
New York, via New Orleans and Eagle Pass, to City of Mexico	3,174
New York, via New Orleans and Laredo, to City of Mexico	2,908
San Francisco via El Paso to City of Mexico	2,510
Chicago to City of Mexico, via El Paso	2,866
Chicago to City of Mexico, via Eagle Pass	2,471
Chicago to City of Mexico, via Laredo	2,155
St. Louis to City of Mexico, via El Paso	2,584
St. Louis to City of Mexico, via Eagle Pass	2,189
St. Louis to City of Mexico, via Laredo	1,823
Kansas City to City of Mexico, via El Paso	2,398
Kansas City to City of Mexico, via Eagle Pass	2,080
Kansas City to City of Mexico, via Laredo	1,714
Chicago to New Orleans	915
Corpus Christi to Laredo	161
Corpus Christi to City of Mexico	1,000

FROM POINTS IN MEXICO TO POINTS IN CENTRAL AMERICA.

Mexico City to Vera Cruz	263
Mexico City to Alvarado	297
Mexico City to Tehuacan	183
Mexico City to Oaxaca	350
Mexico City to Acapulco	290
Mexico City to San Blas	661
Mexico City to Morelia	222
Mexico City to Perote	237

	Miles.
Monterey to Acambaro	478
Acambaro to Manzanilla	350
Benson to Guaymas	353
Minatitlan to Tehuantepec	135
Oaxaca to Tehuantepec	173
Tehuantepec to Tonala	130
Tonala to Tapachula	115
Tapachula to Retalhuleu	55
Mexico Oaxaca to Santa Ana	992
Alvarado to Minatitlan	110
Minatitlan to San Cristobal	200
San Cristobal to Coban	150
San Cristobal to Guatemala City	205

FROM POINTS IN CENTRAL AMERICA TO POINTS IN SOUTH AMERICA.

Coban to Santo Tomas	140
Santo Tomas to Truxillo	
Retalhuleu to Quezaltenango	40
Retalhuleu to Escuintla	65
Escuintla to Santa Ana	85
Escuintla to boundary (Rio Paz)	58
Escuintla to Sonsonate	80
Santa Ana to San Salvador	35
Sonsonate to San Miguel (by coast)	115
Sonsonate to La Union (by coast)	138
San Miguel to Goascoran	30
La Union to Goascoran	30
San Miguel to Chinandega	120
Chinandega to Rivas	147
Rivas to Matina	200
Guatemala City to Santa Ana	100
Guatemala City to Tejutla	80
Tejutla to Chalatenango	30
Tejutla to Cojutepeque	42
Tejutla to San Miguel	126
San Vicente to Chalatenango	31
Goascoran to Choluteca	40
Choluteca to Chinandega	47
Choluteca to boundary	10
Chinandega to Momotombo	45
Chinandega to Managua	75
Managua to Granada	32
Granada to Rivas	40
Rivas to boundary of Nicaragua and Costa Rica	20
Boundary of Nicaragua and Costa Rica to Matina (Colton's)	180
Matina to boundary of Costa Rica and Colombia	130
Matina to Panama	290
Matina to Aspinwall	275
Panama to a point 7° north 77° west	250
Aspinwall to a point 7° north 77° west	300

DISTANCES MEASURED BY THE FRENCH EXPEDITION (ALONG THE ROADS).

Quezaltenango to Totonicapan	15
Totonicapan to Solola	32
Solola, Guatemala City	71
Guatemala City to Los Esclavos	46
Los Esclavos to Jalpatagua	31
Jalpatagua to Ahuachapan	29
Ahuachapan to Apaneca	9
Apaneca to Nahuizalco	12
Nahuizalco to Sonsonate	9
San Salvador to Cojutepeque	26
Cojutepeque to San Vicente	19
San Vicente to San Miguel	65
San Miguel to La Union	32

DISTANCES IN SOUTH AMERICA.

	Miles.
Point 7° north 77° west to Quibdo	95
Quibdo to Cartago	80
Cartago to Popayan	160
Popayan to Quito	240
Quito to Cuenca	205
Quito to Riobamba	105
Cuenca to Alausi	55
Cuenca to Cerro de Pasco	600
Cerro de Pasco to Cuzco	350
Cuzco to Jujuy	1,331
Jujuy to Tucuman	220
Tucuman to Buenos Ayres	773
Buenos Ayres to Valparaiso	870
Cartago to Buga	60
Buga to Cali	35
Cali to Popayan	65
Popayan to Pasto	110
Pasto to Quito	132
Riobamba to Macas	90
Macas to Moyobamba	250
Moyobamba to Cuzco	640
Moyobamba to Cerro de Pasco	370
Point 7° north 77° west to Antioquia	80
Antioquia to Medellin	45
Medellin to Honda	90
Medellin to Cartago	106
Honda to Bogota	110
Honda to Neyva	150
Honda to Cartago	115
Neyva to La Plata	50
La Plata to Popayan	52
Popayan to Nauta or Oran	510
La Plata to Nauta or Oran	500
Popayan to Moyobamba	595
La Plata to Moyobamba	605
Nauta to Cuzco	650
Oran to Cuzco	690
Nauta to Quito	485
Neyva to Moyobamba	650

DISTANCES GIVEN BY CORTES "BOLIVIA."

	Potosi.	Santa Cruz.	Oruro.	La Paz.	Cochabamba.
	Miles.	*Miles.*	*Miles.*	*Miles.*	*Miles.*
Sucre	87	372	225	30	195
Potosi	.....	459	195	342	282
Santa Cruz	459	.....	480	87	357
Oruro	195	480	.....	282	123
La Paz	342	627	147	.....	270
Cochabamba	282	87	357	123	.....

FROM CHURCH'S "ROUTE TO BOLIVIA."

	Miles.
Jujuy to Potosi	420
Jujuy to Cochabamba	717
Jujuy to Oruro	615
Jujuy to La Paz	762
Jujuy to Rosario	836
Rosario to Buenos Ayres	240
Curumba to Santa Cruz	570

FROM OTHER AUTHORITIES.

	Miles.
Iquitos to Nauta	78
Nauta to Sarayacu	248
Sarayacu to Tierra Blanca	49
Nauta to Tierra Blanca	198
Cerro de Pasco to Huanuco	79
Cerro de Pasco to Tarma	85
Cerro de Pasco to Jauja	117.2
Cajamarca to Chachapoyas	183
Cuzco to Puno	272
Puno to La Paz	162
Jauja to Tarma	34

Total length of Putumayo in a straight line about 600 miles.

Raimondi says that the usual length of the legua is about 5 kilometers (varas 5983) or 3.1 miles.

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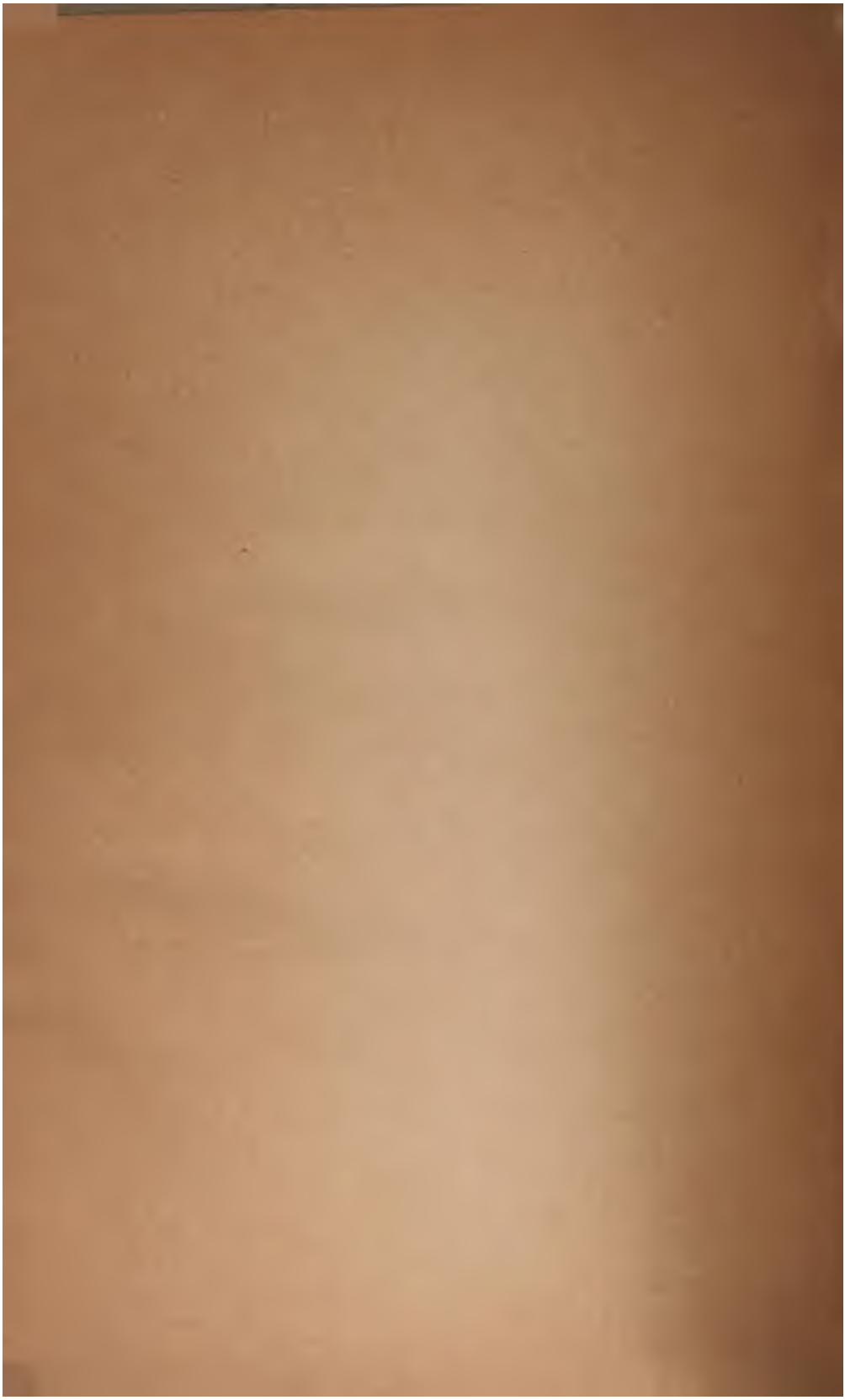

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